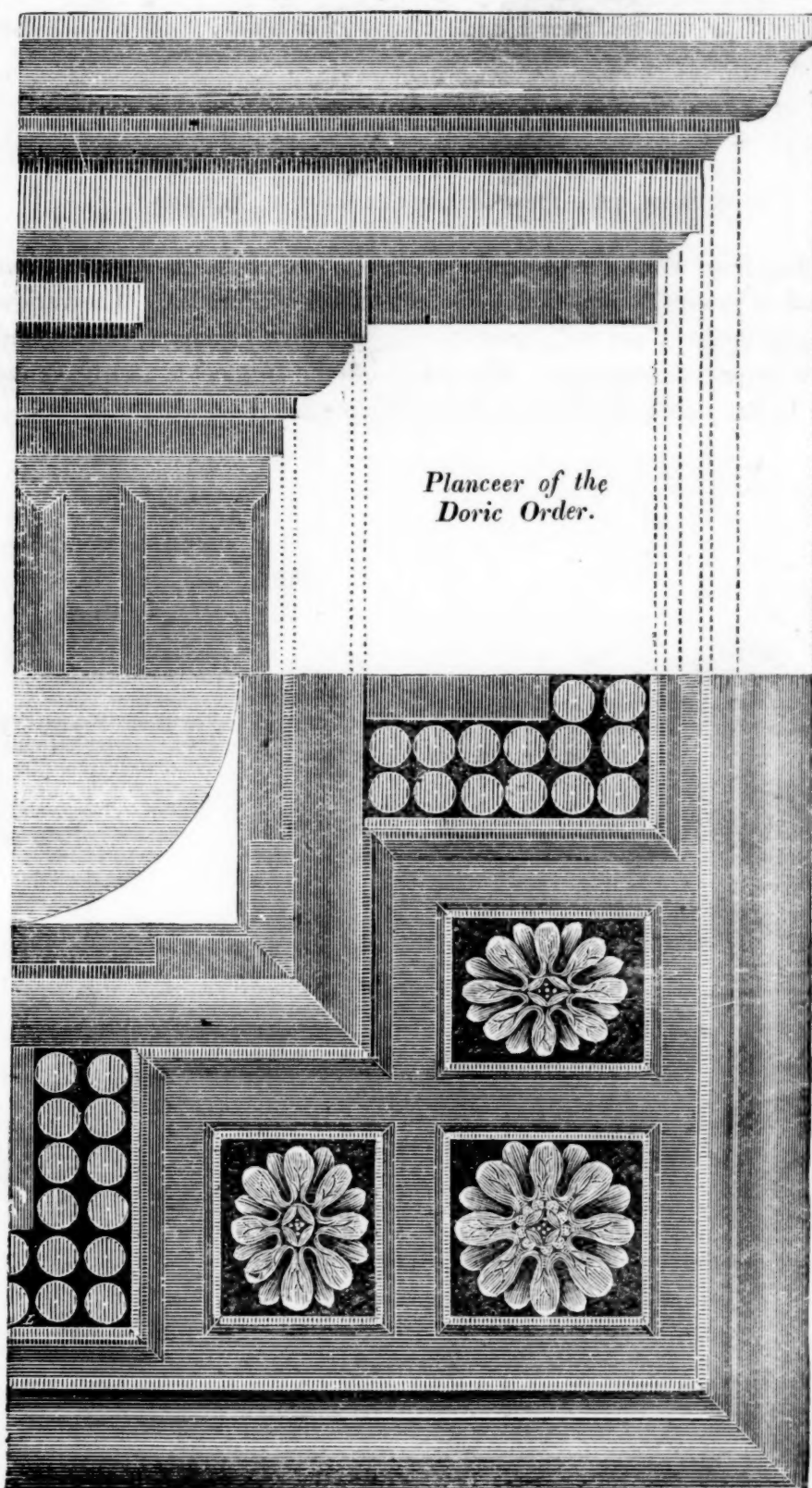


MECHANICS' MAGAZINE, AND JOURNAL OF THE MECHANICS' INSTITUTE.

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[WHOLE NUMBER, 45.]



THE STUDENTS' INSTRUCTOR

IN DRAWING AND WORKING

THE FIVE ORDERS OF ARCHITECTURE.

BY PETER NICHOLSON, ARCHITECT.

(Continued from page 266.)

PLATE XVIII.

FROM THE TEMPLE OF THESEUS AT ATHENS.

The building from which this example is taken is one of the most perfect remains of antiquity, and is generally supposed to be of the age of Pericles. The various parts have an elegant contour, are well proportioned, of a light character, consequently it is well adapted for private buildings. The column in the original is nearly six diameters in height. In this plate part of the pediment is shown.

TEMPLE OF THESEUS.

Plate 19.

Fig. 2.

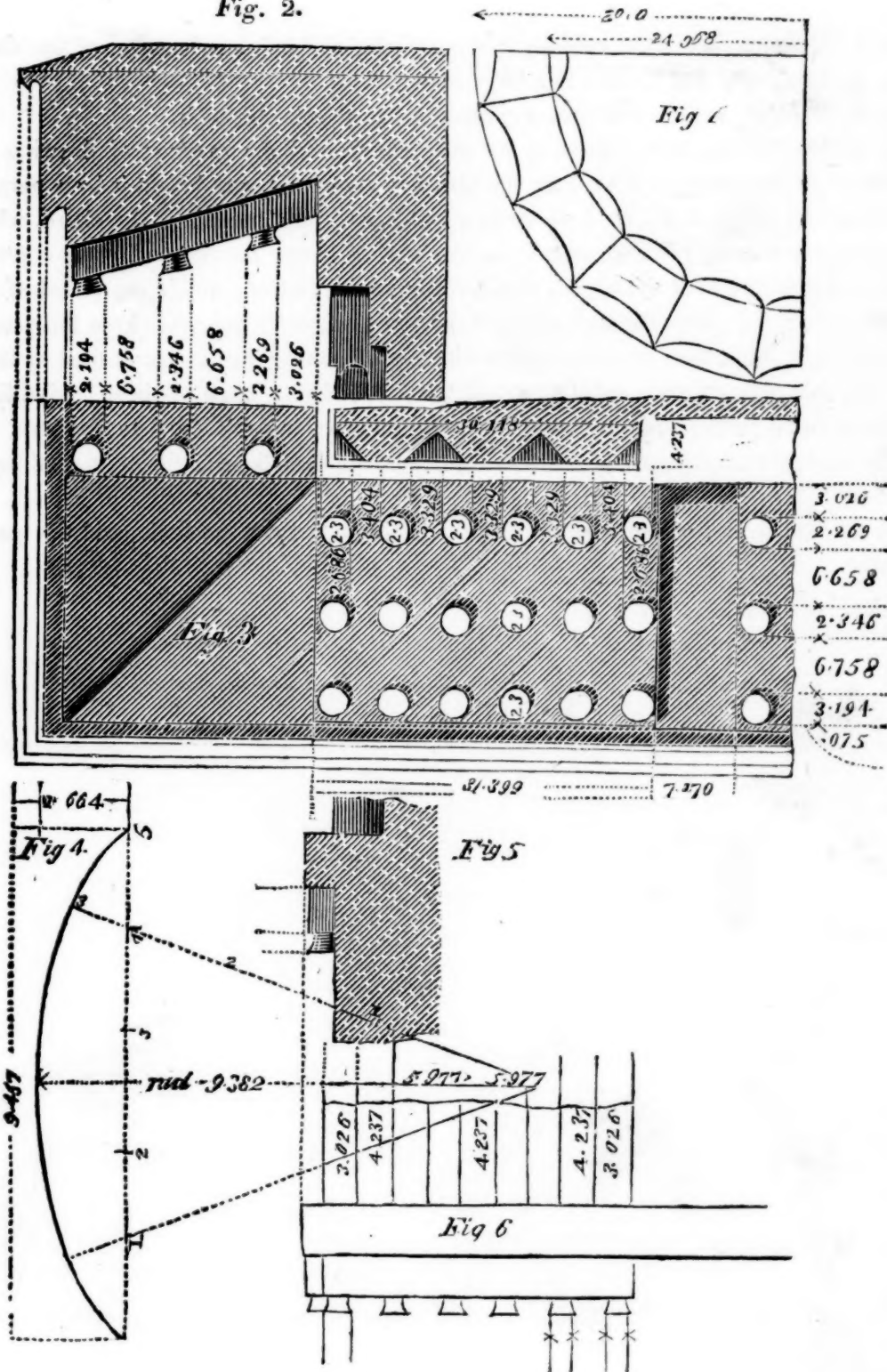


PLATE XIX.

PARTS AT LARGE AND IN DETAIL OF THE PRECEDING EXAMPLE.

Fig. 1. Quarter plan of the column, at the superior and inferior diameter of the shaft.

Fig. 2. Profile of the cornice to a large scale.

Fig. 3. Soffit of the corona, with a section of the angular triglyph.

Fig. 4. One of the flutes showing its proportions, and the manner of drawing its elliptical segmental figure: first draw the chord to its extent, and bisect it by a perpendicular, set the depth of the flute on the perpendicular, from one side of the chord, which will give the extremity of the flute: from this extremity set the radius in the contrary direction, extending over the chord, which will give the centre: divide the chord of the flute into five equal parts, through the first division from each end, and from the centre, draw two right lines, then upon the centre with the radius describe an arc limited by these lines, and this will give the middle part of the flute: divide each of these radial lines into three equal parts: take the first point of division in each next to the arc, and describe each remaining part of the flute, and this will form the elliptic segmental figure of the flute.

Fig. 6. Lower part of the triglyph with the architrave band, the tenia, and the pending guttæ.

PLATE XX.

OTHER PARTS AT LARGE OF THE FOREGOING, AND OF THE FOLLOWING EXAMPLES.

Fig. 1. Profile of the echinus of the capital of the temple of Theseus to a large scale: this moulding as well as that of the temple of Minerva, is an hyperbola, or the portion of one: the lower part from the greatest projection at the top to the bottom, being one of the legs; the upper part forming the quirk or recess above, part of the other leg, and the greatest projection the vertex. It is something singular, that the very ancient mouldings in Grecian capitals, should be of this form, and some of them quite straight, from one end to the other, which may be considered as a section of the cone through the vertex.

Fig. 2. Annulets under the echinus of the capital of the column. The reader may here observe that the annulets continue in the general form of the curve, viz. the recesses in the curve itself, and the extremities in a line parallel to that curve.

Fig. 3. Profile of the echinus of the capital of the Doric Portico, as in the following plate; this moulding is singular, being of an elliptical figure; it is more than a quadrant. This portico was built while the government of Athens was in the hands of the Romans, who were partial to mouldings of a uniform and bold curvature; the taste of the Grecians, it appears, began to blend with that of their conquerers, hence I account for the elliptic form of this member; it is a medium between a hyperbolical and a circular moulding.

Fig. 4. Part of the annulets of the capital of the same column, no less singular in their construction than the echinus, or other members of this example, being disposed vertically, and in the form of chamfered rustics; whereas the annulets of other Grecian remains follow the contour of the echinus, as has been before observed.

PLATE XXI.

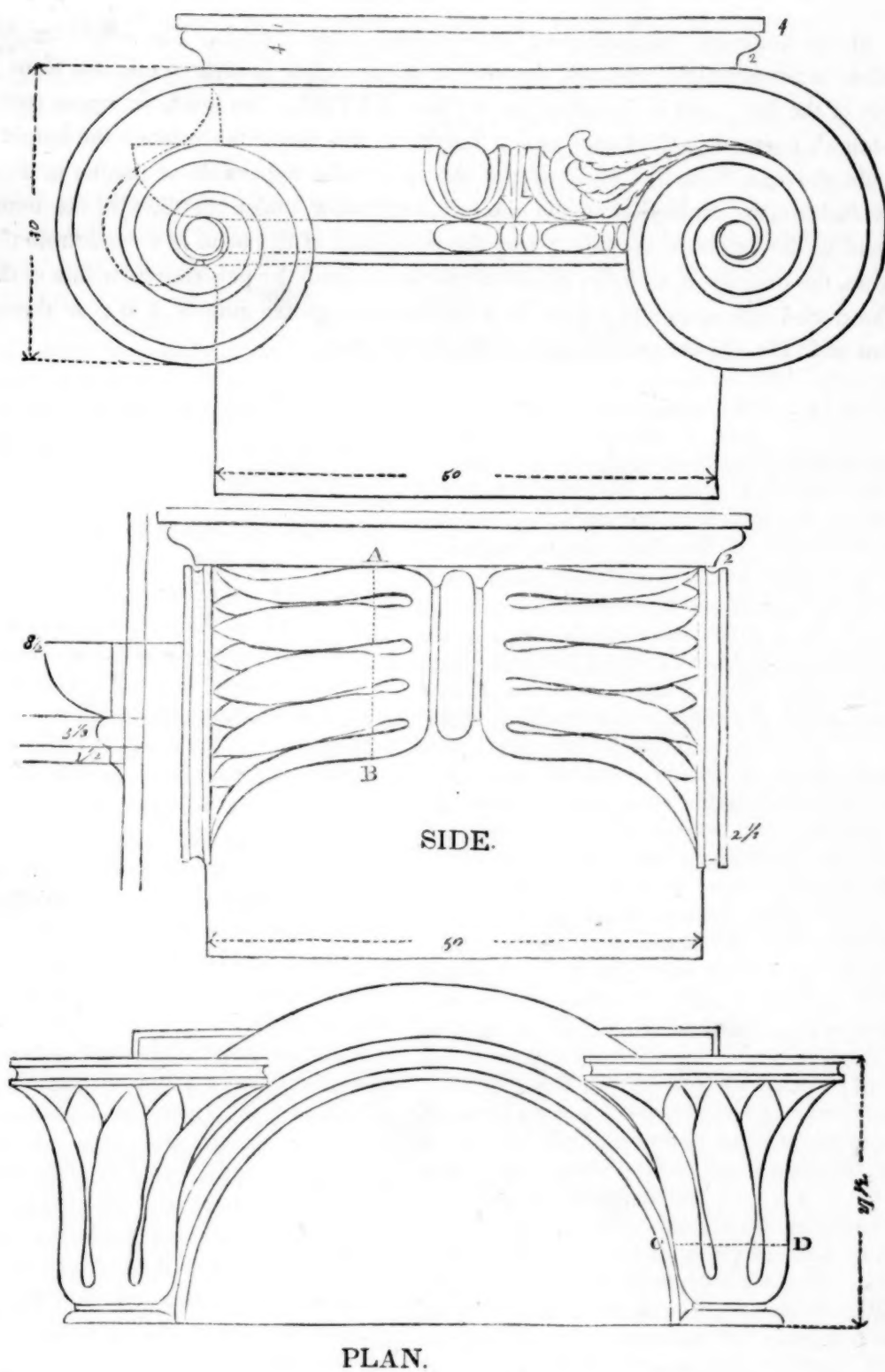
FROM THE DORIC PORTICO AT ATHENS.

This plate exhibits the contour, the elevation, and proportions of the members in minutes and parts of a minute. This example, although singular on account of its approach to the Roman style in the members, is in its general form the same as other Grecian examples.

As Mr. Stuart appears to have bestowed particular attention to the measures of these Doric examples, here shown, I have with considerable pains reduced the original measures of feet, inches, and decimals of an inch, by arithmetical calculations into minutes, and decimal parts of a minute, and not by measuring them from two scales which would have been more expeditious to me, but much less accurate: each minute is consequently divided into ten equal parts, each of these again into ten, and so on as long as division can be made. By these universal proportions, the construction will be more easily obtained by students in general.

ROMAN IONIC.

Plate 22.



The Five Orders of Architecture.
OF THE IONIC ORDER.

PLATE XXII.

Shows the front, side, and plan of the Roman Ionic capital. The whole height of the volute is twenty-eight minutes, the centre of the volute is sixteen minutes from the top side of the list; and is described as in Plate XXVIII.; the bead, or upper part of the astragal, is equal in thickness and in height, to the eye of the volute; the height of the ovolo above, is from the upper side of the eye, to the upper side of the list in the second revolution; the projection of the cincture, or hollow under the fillet of the astragal, is equal to the height of the fillet; and the projection of the bead is a semicircle; for the ovolo, the quarter of a circle, whose projection is from the perpendicular line of the fillet. The dotted line upon the volute, is a section through the side at A B; or through the plan at C D; the ornamental part is drawn by hand.

TO CORRESPONDENTS.—C. Anderson is informed that Automatic flax machinery has been in successful operation for some time. We do not know how far this branch of industry has been carried in our country. For information in regard to the machines, we refer to "Ure's, Philosophy of Manufacture."

Our correspondent P. K. F. is, we doubt not, correct in his opinion that "if we could spare still more room and give in each number the design for a house or other building, with plan, elevation, specifications and estimates of cost," &c., it would be useful to many readers; and we should be gratified to be able to give them, and shall do so when the circulation of the Magazine will warrant it.—Eds. M. M.

[For the Mechanics' Magazine.]

MR. MINOR.—I have several times inquired for a book of designs for dwelling-houses, and such other buildings as are in common use in this country; but I have not found any thing suited to the wants of those whose incomes are less than five or six thousand a year; nor have I seen any attempt at an American work of this description. That such a work is much needed will be manifest to every reflecting person, who has seen the tasteless and inconvenient, and withal somewhat expensive fifty-cornered edifices that abound in the eastern and middle sections of this country, where, indeed, the buildings are said to be better than in the other parts. When I saw the announcement of your intention to publish something of the History of Architecture, it occurred to me that, if you could spare still more room—so much as to give in each number a design for a house, or other building, with the plans, elevations, specifications, and estimates of cost—it would be very acceptable to your readers generally. Of course, in order to make it the most useful, you would furnish designs for people of moderate and even very small means, as well as for the wealthy. I am likewise inclined to think that, besides original design, it would be well to publish plans of the most approved buildings in this and other cities.

Should you find it expedient to admit matter of this kind, I shall be happy to offer some remarks on the large buildings, so much used in Paris and other European cities, on account of their economy in ground rent. Your obdt. servt., T. K. F.

EFFECT OF THE VELOCITY OF AIR UPON ITS USE IN SMELTING IRON.

M. Teploff, one of the Russian Mining Corps, in an article on the improvements recently introduced into the smelting of iron in Russia, makes the following statement. In the smelting furnaces of the Ural, where the quantity and velocity of the blast are properly regulated, 1.4 of pig iron is obtained by 1 of charcoal fuel, while in other furnaces they obtain but 4. and 6. by the same consumption of fuel.

The velocity of the blast being increased, the heat within is increased, without a corresponding consumption of fuel. In an experiment made by order of the government, it was found that one hundred cubic feet of air, under a pressure of two inches of mercury, produced the same effect as two hundred cubic feet, under a pressure of one inch, with this difference, that, in the latter case, twice the fuel was consumed, which was required in the former case.

In one furnace which is mentioned, 22,000lbs. of iron were obtained in twenty-four hours, by 16,000lbs of charcoal. Previous to the due regulation of the draught, they consumed twice this amount of fuel for the same yield of iron.

This economy is obtained by duly proportioning to each other the size of the blast pipe, and the pressure of the draught. The relation of these to each other, varies with the furnace.

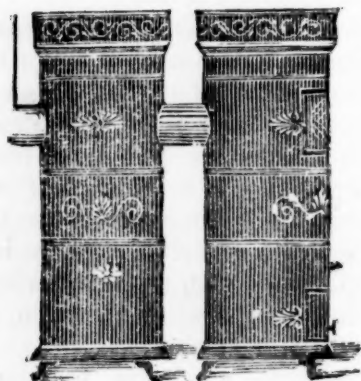
M. Teploff asserts that the results thus obtained exceed those with the hot-air blast, but it does not appear that any comparisons have been made under his examination, and with the charcoal fuel.

To regulate the draught, it is recommended to place two mercury or water-gauges, one near the blast-pipe, the other near the governor of the blowing-machine. By varying the pressure, and the diameter of the nozzle of the blast-pipe, making the latter smaller as the former is increased, and *vice versa*, the best proportion is to be ascertained.—[Annales des Mines, vol. vii.]

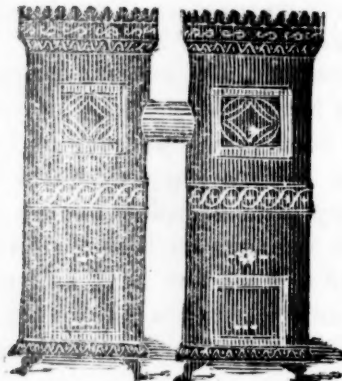
Parlor Stove.



Hall Stove.



Chamber Stove.

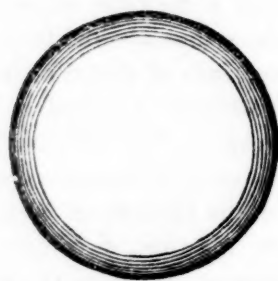


REMARKS ON THE STRUCTURE AND PRINCIPLES OF OLMSTED'S STOVE, FOR BURNING ANTHRACITE COAL.

The Plate (see Frontispiece) represents three varieties of this stove, adapted respectively to parlors, to chambers or offices, and to halls or large open rooms, as stores and churches. The *Parlor* and *Chamber* stoves are designed to stand close to the fire place, being connected to the chimney by short pipes which proceed from the back of each cylinder. The *Hall* stove is intended to communicate with a distant flue, by a smoke pipe.

In the construction, the inventor (Professor Olmsted of Yale College) was guided by principles strictly philosophical. After it was observed that the volume of aeriform products, arising from the combustion of anthracite coal, is exceedingly small, when compared with that from wood and other kinds of fuel, it was perceived, that a great loss of effect must accrue from transmitting the heated current through a large open pipe. Thus in figure 1., which represents a pipe eight inches in diameter, it is obvious

Fig. 1.



that the heated air, which is itself a bad conductor of heat, would part with its heat slowly except within a small distance from the surface, such as is represented in the shaded circular ring, while the large portion of the capacity of the pipe, constituting the vacant space within this ring would be nearly ineffectual. Hence, it would be only after circulating through a very long pipe, that the heat could be all absorbed and distributed to the apartment.

To remedy this difficulty, several different expedients have been adopted. Some have employed a *small* conducting pipe, or a series of small pipes, with the view of se-

curing a greater amount of surface in proportion to the interior vacant space.* But although a comparatively small pipe will serve to convey off the heated air from an anthracite coal fire when well ignited, yet on first kindling, when the volume of gases is much greater, the draught of such a pipe is insufficient, and smoke and noxious fumes flow into the room. Such pipes also are peculiarly liable to get choked by the deposit of soot.

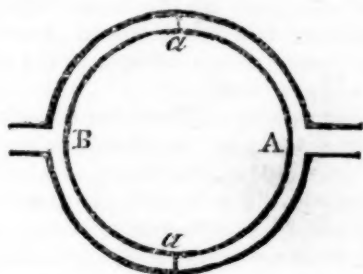
Others have attempted to obviate the difficulty in question, by using a *flattened* pipe, or some equivalent contrivance, where the opposite surfaces are made to approximate to each other, and the proportion of vacant space is greatly diminished. A fair specimen of this structure, is seen in the ascending cast iron pyramidal pipe of Doctor Nott's stove.

It occurred to Professor Olmsted, that the same end might be more conveniently attained by the combination of two similar figures, like two concentric cylinders. Here the parallel surfaces may be brought extremely near to each other, so as to force the heated current into close contact with the absorbing surfaces, and yet space enough be left to secure a good draught. For example, if we make the outer cylinder 14 inches in diameter, and the inner cylinder 12 inches, leaving only 1 inch distance between the two, the space occupied by the circular ring will be proportioned to the difference between the squares of the diameters, and consequently be proportioned to the difference between 144 ($=12^2$) and 196 ($=14^2$); that is, it will be as the number 52, and therefore proportioned to a pipe $7\frac{1}{2}$ inches in diameter.† In like manner, a seven inch cylinder within a nine inch, leaves a space equivalent to that of a pipe more than $5\frac{1}{2}$ inches diameter.

We have then, in this combination all we can desire, namely, an ample draught along with a great amount of surface, and yet a vacant space so narrow that the heated current cannot flow through it without being brought closely into contact with the ab-

sorbing surfaces. Indeed, so small is the volume of aeriform products arising from the combustion of anthracite coal when well ignited, that, by making a separate pipe for kindling, (which is closed as soon as the fire burns freely,) the two cylinders may be

Fig. 2.



brought within *half an inch* of each other as is represented in figure 2, and yet, when free from soot, a good draught obtained. It has, however, been found preferable, on all accounts, to leave the distance $\frac{3}{4}$ of an inch. The employment of this principle, namely, a greater proximity of the opposite absorbing surfaces than has been heretofore used, constitutes the first peculiarity of Olmsted's stove.

But, secondly, it has been ascertained, by experiments in transmitting heated air through a pipe, that the absorbing effect of the pipe is increased by making the heated air descend and ascend, as in traversing a succession of elbows.* In drums somewhat resembling this *Radiator*, inasmuch as concentric cylinders have been employed, the usual practice has been to place the two cylinders so far asunder as to lose that signal advantage of *closeness of contact* between the heated current and the absorbing surface, an advantage which is gained only by a proximity of the parallel surfaces. Moreover, it has been usual to introduce the heated air in such a way as to make it ascend through the open space between the two cylinders, flowing loosely from a pipe in the bottom to one in the top of the drum. But a peculiar advantage, (which is remarkable considering the simple manner in which it is gained) is secured by employing a vertical partition,† which forces the heated air first to descend on one side, and then, flowing under the inner cylinder, to ascend on the other side,

*The surfaces of cylinders are proportioned to their diameters, while their capacities are proportioned to the *squares of the diameters*. Thus, if we compare a six inch and a three inch pipe, their capacities are as 36 to 9; or the larger pipe has four times the capacity

† Let D be the diameter of the larger, and d that of the smaller cylinder. Then the corresponding circular sections will vary as D^2 to d^2 ; that is, putting C for the larger and c for the smaller cylinder,

$C : c :: D^2 : d^2 \therefore C - c : c :: D^2 - d^2 : d^2$;
or $C - c \propto D^2 - d^2$. Q. E. D.

* See, particularly, M. Marcus Bull's Experiments on Fuel, where the efficacy of this principle is fully exhibited.

† Seen at a a, in figure 2, which is a horizontal section of the radiator, near the top.

thus traversing the surfaces of the two cylinders in a manner the most favorable for the perfect absorption and distribution of the heat. But, thirdly, since the inner cylinder would thus become rapidly heated, it was necessary to introduce a current of cold air into the central space, which was easily done by letting an open pipe pass through the bottoms of both cylinders. By this means the colder air of the room, which is always nearest the floor, would flow into the vacant space, as air flows into the chimney of an argand lamp.

These three principles combined, namely, *a greater proximity of the absorbing surfaces than had before been employed,—a vertical partition, causing the heated air to traverse those surfaces more effectually,—and a current of air flowing through the central parts of the radiator, constitute the peculiarities, and form the grounds of the claim to originality in this stove.*

Fig. 3.

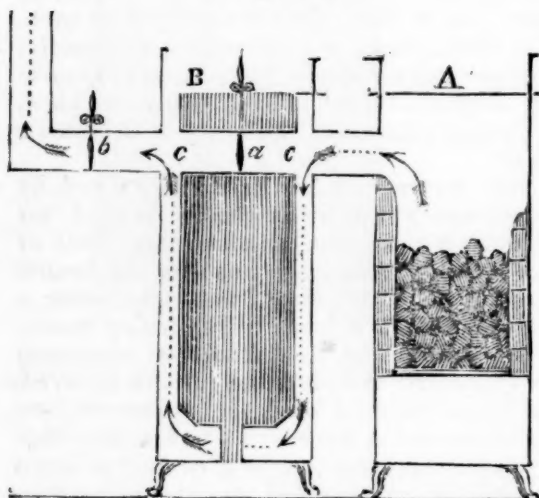


Figure 3 represents a vertical section of the "Hall Stove." The structure is composed of polished Russia sheet iron, and consists of two parts, the furnace A, and the radiator B. The furnace is lined with fire brick, and all the other parts of the entire structure which are exposed to the action of the heated gases, are protected by a wash which hardens by heat, and at once defends the iron from burning out, and prevents its being corroded by the acid fumes that are produced in the combustion of anthracite coal. For the ease of kindling, and to prevent smoke and gas, a pipe, open at both ends, is let through the inner cylinder, as represented at *c c*, forming a direct communication from the furnace to the smoke-pipe. As soon as the fire is well kindled, this pipe is closed by the damper *a*, when the current immediately takes the circuitous route indicated by the arrows. A copious radia-

tion of heat from the whole external surfaces of the stove, with the addition of a constant current of hot air rising from the top of the radiator, diffuses warmth rapidly, and in a few minutes brings the room to the required temperature. When the fire is too intense, the damper *b*, which closes half the capacity of the pipe, is turned, and the fire continues to burn uniformly, demanding very little attention for many hours.

A singular *softness and purity of air* has been found to attend the use of this stove. This desirable quality has been secured by the following means. First, care has been taken not to suffer any part of the apparatus to become so hot as to contaminate the air of the apartment, by scorching the particles of animal or vegetable matter, that are always in greater or less amount floating in a family room. The furnace is lined with non-conductors, which do not permit the metallic surface to approach a red heat; and as soon as the heated current issues from the furnace, instead of traversing as usual, a narrow pipe, which in the parts nearest the furnace becomes excessively heated, the current on entering the radiator instantly expands over the extensive surfaces of the two cylinders, in contact with which, both within and without, the coldest air of the apartment is continually and freely circulating. Secondly, the *circulation* which is given to the air of the room by causing it to flow in at the bottom of the radiator, and, becoming rarified by heat, to flow out at the top, thus continually disturbing the equilibrium of the atmosphere of the room, has a signal effect in maintaining uniformity of temperature, and preserving the purity of the air. Finally, distributing the heat at the bottom of the apartment instead of the top, as is the case when given out from a common smoke pipe, contributes also a large share towards creating an equality of temperature above and below, securing warmth to the floor, and consequently to the feet, while the head is relieved from that oppressive sensation, which is experienced by many persons in a room whose temperature, near the ceiling, is a number of degrees higher than at the floor.

The testimony of two eminent physicians, of the cities of New-York and Brooklyn, attest the suitability of this apparatus for the apartments even of invalids.

From JOHN NEILSON, M. D., of the city of New-York, dated June 1st, 1836.

"Olmsted's Stove appears to me the very best contrivance to promote comfort and

health, during our severely cold winters.—I have made use of two of these during the last winter,—one in our bed room, the other in the dining room,—with the most perfect satisfaction to the family. The warmth is uniform, comfortable, and not at all oppressive; and what is very desirable, furnished at a very small expense of fuel. The heat being diffused from a large surface, moderately heated, is preferable to that from a more limited surface intensely heated. The material, too, of which the stove is constructed, appears to give out a soft and pure air, and its circulation through the apartments is uniform as well as comfortable. Also, the method of regulating the heat by means of valves or dampers, is a very valuable improvement.”

FROM ALFRED C. POST, M. D., of the city of Brooklyn, dated June 3d, 1836, (addressed to the patentee.)*

“It gives me pleasure to be able to speak of your invention in terms of strong commendation. Your stove appears to me to combine in a greater degree than any other with which I am acquainted the following desirable qualities, viz; ornamental appearance, cleanliness, easy management, economy in the use of fuel, and salubrity. With regard to the first of these qualities, the beautiful material of which your stoves are constructed, and the simple and elegant form which you have given them, seem to place them in advance of any other stoves which I have seen. When they are well managed, they are very cleanly, scarcely allowing any dust or ashes to escape into the room. It is very easy to kindle the fire, either with hard wood or with charcoal; and, by a little attention to the valves and doors, the heat may be regulated to almost any extent. The quantity of fuel which they consume is very moderate, in proportion to the amount of heat given off.—The last and most important advantage is, that they favor a *pure and wholesome state of the air in the room where they are placed*. By exposing a large extent of surface, they secure a sufficient amount of heat, without being intensely heated at any one point; and they thus avoid the unpleasant effects which result from the concentration of heat, which vitiates the air by the combustion of particles of animal and vegetable matter floating in the room, and probably also by the decomposition of the water, which is combined with the air, liberating hydrogen gas.

I think it, however, important to the salu-

*Dr. Post used two stoves during the season, a large Hall, and a Parlor Stove.

bility of your stoves, as well as to that of all others in use, that water should be evaporated upon them.”*

Although the radiator of this stove may be attached to a furnace of any construction, yet the best kind of furnace, and that usually employed, is one of polished sheet iron lined with fine brick. The less the portion of heat distributed from the furnace itself, the better. The smooth surface of sheet iron, and the non-conducting power of fire brick, unite to confine the heat of the furnace. By this means, the coal being kept from cooling, burns with increased intensity; and the air of the room is preserved from that contamination which results when the furnace is heated too hot. But if the heat is not distributed from the furnace itself, the apparatus employed for this purpose must have the requisite efficacy, or an unnecessary portion of the heat will escape into the chimney. A long pipe suggests itself as the first expedient. But this is attended with various disadvantages. It is expensive, unsightly, and cumbrous; and, as usually constructed, it gives out the heat in the upper parts of the room, while it ought to be distributed as near the floor as possible. For all these evils, the Radiator of Olmsted's stove furnishes an adequate remedy. In proof of this may be offered the following certificate of *Professor Andrews* of Boston, a gentleman who has paid much attention both to the philosophical principles, and to the practical management of heat.

FROM PROFESSOR E. A. ANDREWS, of Boston, dated June 6, 1836.

“Having made use of Olmsted's Stove during the whole of the past season, it gives me sincere pleasure to state the result of my experience respecting it. Its advantages may be comprised, I think, under the following heads:

1. It is so constructed that, by means of its peculiar *Radiators*, all the heat not absolutely necessary to produce a draught through the funnel of the chimney, is made available in warming the room. In *economy of fuel*, therefore, no other stove is likely to surpass it.

2. As this advantage is gained without the use of a pipe, which is always an inconvenient and unsightly appendage to a

*The authority of Doctor Post on this point is entitled to the greatest consideration, although, on account of the great **UNIFORMITY** of temperature afforded by these stoves, most who have used them, have thought an evaporating dish unnecessary, unless the heat is raised above 70 degrees.

stove, the two requisites of *elegance and cheapness* are happily united.

3. As the stove and its radiators occupy the lower part of the room, the cold air, which is always near the floor, soon becomes heated, and mingling with that above, produces a *uniform temperature* through the apartment.

4. Such is the peculiar construction of the whole apparatus, that no part of it ever becomes excessively heated; and the *air of the room, consequently, remains remarkably pure.*

5. *The heat can be more perfectly regulated* in this than in any other stove I have ever seen; and whether the temperature of the room requires to be raised five or fifty degrees, it may be done with equal ease and certainty, and maintained uniform for any length of time.

6. The construction and management of the fire in this stove is peculiarly easy; and if properly managed, *no dust can ever escape from it* into the room.

On the whole, then, I prefer this stove to any which I have ever used, or whose operation I have ever witnessed."

From the Journal of the Franklin Institute.

ON THE PRODUCTION AND MANUFACTURE
OF SALAD OR TABLE OIL IN THE UNITED STATES.

The following remarks are intended to apply to that strip of the United States, which is comprehended between the latitudes of Cape Hatteras and Boston Bay, extending westward.

Although there is no part of this extensive region in which the olive tree could be cultivated, except when protected by the green house, and therefore, the inhabitants are denied the advantages of this useful tree, it does not follow, that nature has denied them the means of procuring an excellent and pleasant substitute for olive oil, and one that could be brought into market at a moderate cost. Between them and this enjoyment, ignorance is at present a barrier, and in this case, as in many others, this is strengthened in its result, by prejudice.

In French Flanders, the farmers cultivate in large fields, and to a great extent the *White Poppy*. The seeds of this plant are collected and bruised in some way, and an oil expressed from them, which in all respects resembles olive oil, and is the source from whence is derived a large proportion of what is consumed in Paris.

The poppy oil so much resembles olive oil, that strangers who visit Paris take it for that oil. These are facts as regards the consumption.

Of the state of this important branch of husbandry and manufacture, we the people of the United States know nothing. How is it cultivated, the seed collected, the oil preserved? Does the land require to be sown every year, or does it seed itself? What sort of a mill does it require? What is the product in oil, or in profit? In short, we have every thing to learn, except that, incidentally we have heard that fifty pounds of beet cake, after the sugar maker has got what he wants out of it, and ten pounds of poppy seed after the oil maker has done with it, will keep ten sheep a day and fatten them.

We know that since the article on beet sugar appeared in the Journal of the Franklin Institute, requesting those who knew any thing of the subject to favour the editor of the Journal or the public with information, a well qualified agent has been sent to Europe to acquaint himself with the whole agricultural and manufacturing business that produces sugar.

On the present occasion, we invite the patrons of our country's industry and resources, to communicate for publication, what they know on the above interesting branch of French husbandry, &c. And we therefore request the wealthy and patriotic, to consider whether the case of oil does not resemble that of the sugar from the beet, and whether the best course would not be to adopt a plan similar to that which the friends of beet sugar have chosen.

The time will come when American parents will send their sons to Europe and to other foreign places, to learn the manufacture of beet sugar, of oil, and such other branches of the arts not possessed by us, in the same manner and with better reason that they now do to have them learn medicine and surgery.

J. R.

June 4, 1836.

A MAGNIFICENT EDIFICE.—There are 3000 workmen at St. Petersburg, engaged upon the new cathedral of St. Isaac. The outside of the cupola is to have 24 columns of granite; the portica is 100 feet in length, and supported by 41 columns, with bronze capitals and vases.

SPECIFICATION OF A PATENT FOR A DOFFER FOR WOOL CARDING MACHINES. GRANTED TO STEPHEN R. PARKHURST, PROVIDENCE, RHODE ISLAND, OCTOBER 10th 1835.

To all persons to whom these presents shall come, be it known, that I, Stephen R. Parkhurst, of Providence, in the county of Providence, and State of Rhode Island, and Providence Plantations, have invented a new and useful doffer, with corresponding rolls, for the wool card, called a finisher.—Instead of a continuous cylinder, this doffer is composed of a set of wheels, or pulleys, of equal diameter with the common doffer, covered with a card in the same way, of three or four inches thickness at the rims, to revolve like the common doffer, placed upon their shaft, an inch, or an inch and a half, apart, and a small angle and parallel with each other, and making such an angle with the shaft as that the spaces between may be fully compensated in their revolution, and the whole surface of the main cylinder be passed over by them; and their rims, or outer surfaces, must be parallel to to their shaft, so as to conform to the surface of the main cylinder. Next, there is a set of pulleys, which I call division rollers; these may be about four inches in diameter, for a common doffer, of the same thickness with the spaces between the different rims, or pulleys, of the doffer, placed upon their shaft at the same angle, turned by a belt, or gear placed before the doffer, with their shaft a little lower than the shaft of the doffer, and so placed that their outer edges will be a little within the rims of the doffer, for the purpose of keeping the wool on the different parts, or wheels, of the doffer, entirely separate, as it is taken off by the top rolls, hereinafter described. The next are a set of pulleys, or wheels, or rims, which I call the top rolls; they are equal in number to the different rims of the doffer, four or five inches in diameter; they may be a little less in thickness than the width of the different rims of the doffer, so that the division rolls may revolve freely between them, placed so as to revolve in contact with their correspondent rims of the doffer, for the purpose of taking the wool from it, and so placed as that they will so bear upon the shaft of the

division rolls as to be turned by it. A comb, if necessary, may be attached to this doffer, to clear the wool from it. The wool taken from the doffer by these top rolls, kept in separate laminae, or flakes, by the division rolls, drawn over the shaft of the division rolls, may be passed through a tube, or a belt, and then run on a spool, or spools; or by a flyer properly replaced, it may at once be twisted into a thread. By regulating the feed of the card, and the speed of the division rolls, the size of the roping, and of thread, i. e. the fineness of them, may be regulated, or adjusted, to suit the work required.

I claim as my invention, and not before known, the doffer before described, together with the top rolls, and division rolls, to correspond with it.

STEPHEN R. PARKHURST.

Specification for a Patent for an improvement in the Rearing of Silk Worms; Granted to GAMALIEL GAY, Poughkeepsie, Dutchess county, New York, Oct. 6, 1835.

To all to whom these presents shall come, I, Gamaliel Gay, of the town of Poughkeepsie, in the county of Dutchess, and state of New York, send greeting.

The hurdles for rearing and feeding silk worms upon, are, or should be, made on a horizontal, four-sided frame, of convenient width and length, and bottomed with cane, or twine, either reticulated, or having interstices between each slat of the cane, or thread of twine; which meshes, or interstices, should be of such dimensions that the silk worm will lie and feed upon them, and the litter of the worms fall through.

Now, be it known, that I, Gamaliel Gay, have invented, and applied to use, a revolving apron, for receiving upon it, and removing, the litter of the silk-worms, which falls through the hurdles, as above mentioned. The specification of which new and useful invention, for receiving and removing the litter of silk worms, as follows:

The revolving apron for a single hurdle, is constructed by placing in a frame, or otherwise at, and immediately under each end of the hurdle, a roller, or cylinder, in length equal to the width of the hurdle; over these cylinders, or rollers, extending

from the outside of the periphery of the one, over and around that of the other is affixed an endless apron of cloth, or other flexible substance, equal, at least in width, to the width of the hurdle. This apron being drawn tight around the rollers, and the ends fastened together, is made to revolve around both rollers, by turning them by a crank affixed to the axle of one of them, or by otherwise revolving the rollers. The endless apron being thus constructed, receives the litter from the hurdle as it falls through, which litter, by causing a semi-revolution of the apron, is removed from under the hurdles, and caused to fall in a heap at one and either end of the hurdles, and may be suffered to fall from the apron either upon the floor, or into a vessel placed at, and partly under, the end of the hurdle, and below the outer periphery of the roller.

In case two or more hurdles be placed in tiers, one above the other, the same apron may be used, in which case an endless and separate apron is required for each hurdle; but the best method, the most convenient and least expensive form of apparatus, and which I claim as a constituent part of my invention, is constructed as follows. Let there be rollers, or cylinders, affixed under each end of each hurdle, the same as in case of a single hurdle; to one roller, below the lower hurdle, attach one end of an apron, of the kind and proportionate width first above specified; let this apron pass under the opposite roller, over the roller next immediately above that, under the roller next immediately above the first roller to which the apron is attached, over the next above roller, and under the next opposite one; and so on according to the number of hurdles in the tier, until the apron reaches the last roller to which the apron should be attached, after adding to the length of the apron at least the length of one of the hurdles, which should be rolled upon the last mentioned roller. The apron thus passing under each hurdle, receives all the litter falling from each, which litter is discharged, part at one end, and part at the other end of the hurdles, by turning the first mentioned roller so as to wind over and around it a quantity of the apron equal to the length of the above hurdle, which winding causes an equal quantity of the apron to unwind from the roller to

which the other end of the roller is attached; after the litter is thus discharged from the apron, the apron is, in part, to be again wound round the upper roller, as first above mentioned, so as to remain until the litter is again discharged.

What I claim as my improvement, and wish to secure by letters patent, in the rearing of silk worms, is the application of a revolving apron, or aprons, placed under the hurdles upon which the worms are fed, for the purpose of receiving and removing the litter falling from them; and this I claim, whether the same be made exactly in the way described, or in any other, operating substantially on the same principle, and by which a similar effect is produced.

GAMALIEL GAY.

SPECIFICATION OF THE PATENT GRANTED TO JOHN BIRD, OF BIRMINGHAM, FOR AN IMPROVED METHOD OF MAKING AND COMPOUNDING PRINTER'S INK, PAINTS, AND OTHER PIGMENTS. SEALED OCTOBER 15, 1835.

My improved method of making and compounding printers' ink, paints, and other pigments is as follows: I take a certain portion of mineral earth or matter found in great abundance on my estate at Dinas Mowddwy in Merionethshire, in North Wales, and other places; which mineral earth or matter, I first wash clean from every portion of slate or other debris, and which after such washing becomes a very fine black impalpable powder if dried, or a very fine paste if wet. This black deposit is a compound prepared by nature consisting of the following substances, and in the following proportions or some like proportions viz., silica 46, alumina 42, and coaly matter 12.

In order to make printers' ink, I take as large a portion of this prepared compound as I deem necessary, and mix and grind it up with boiled oil, or prepared oil, usually used in the making of inks, which when so prepared, is my improved method of making and compounding printers' ink. To make ink used in copper-plate printing, I adopt the method now in use, substituting the above-mentioned compound, in lieu of Franckfort black, or what is usually designated by that name. I then, in order to make and compound paints and other pigments, take in those proportions I find necessary of the above matter, and mix and compound it with oils, spirits, or any other substance requisite for making paints and

other pigments, under which last description I include the making of blacking.

In the manufacture of ink, blacking, paints or other pigments, I do not confine myself to any particular quantities of the ingredients above-mentioned, but take any quantities thereof, which are found most desirable.

I claim no exclusive privilege for the use of any other matter in making and compounding inks, paints or other pigments, except the use of the compound above described, and for the use of the said compound, and for mixing it in any way, or in any proportion convenient for the making inks, paints, and other pigments, I do hereby claim the exclusive privilege. In witness whereof, &c.

Enrolled April 15, 1836.

SPECIFICATION OF A PATENT FOR A MACHINE FOR HULLING COTTON AND OTHER SEEDS. GRANTED TO JOHN AMBLER, JR. CITY OF PHILADELPHIA, NOVEMBER 26TH, 1835.

To all whom it may concern, be it known, that I, John Ambler, Jr. of the city of Philadelphia, in the State of Pennsylvania, have invented an improved machine for hulling and cleaning cotton and other seed which I denominate the Metallic Cotton Seed Huller, and that the following is a full and exact description thereof.

Upon an iron shaft, revolving horizontally, I place two, or any other convenient number of steel or iron disks, or circular plates of metal, so as to run with perfect truth upon the shafts; disks of eighteen inches in diameter, I have found to answer the purpose perfectly well. By means of a pointed chisel I raise teeth, in the manner of rasp teeth, on each side of these revolving disks, or I groove, or roughen them in any other manner calculated to produce the intended effect. The disks, as they revolve, pass through the flat bottom of a hopper, by which they are surmounted, projecting above the said bottom about one third of their diameter. Steel plates, cut like the disks, are placed on each side of them; the upper edges of these plates are on a level with the bottom of the hopper, and they extend down to the lower part of the revolving disks, covering about one-fourth part of the face thereof, this having been found sufficient to effect the hulling, perfectly.—These lateral plates are attached to adjustable sliding bars, or fixed in any other way which will admit of their distance from the disks being regulated according to

the kind of seed to be hulled. It has been found best not to increase the opening between the plates and disks at the upper edge, but to preserve their parallelism throughout, so that but one seed can find its way between them at a time.

The seeds and hulls fall upon a sloping skreen, or riddle, which is made to shake, and to carry the portion which does not pass through the riddle to a revolving picker, placed at one end of the frame; this picker, and the hollow segment within which it revolves, are set with teeth in the manner of a picker for wool, and serve to separate the matted portion of the hulls, cotton, and seed, so that the lighter portion may be driven off by a revolving fan placed at the lower part of the machine for the purpose of cleaning the hulled seed.

The riddles, screens, shakers, fan, &c. which I employ, do not differ from such as are in common use for cleaning grain and other seed, and do not, therefore, require to be particularly described, as they make no part of my invention, and may be variously modified, or used separately from the hulling apparatus.

What I claim as my invention, and wish to secure by letters patent, is the hulling of cotton, and other seed, by means of revolving disks, or plates of steel, or other metal, made and operating substantially in the manner herein before set forth.

JOHN AMBLER, JR.

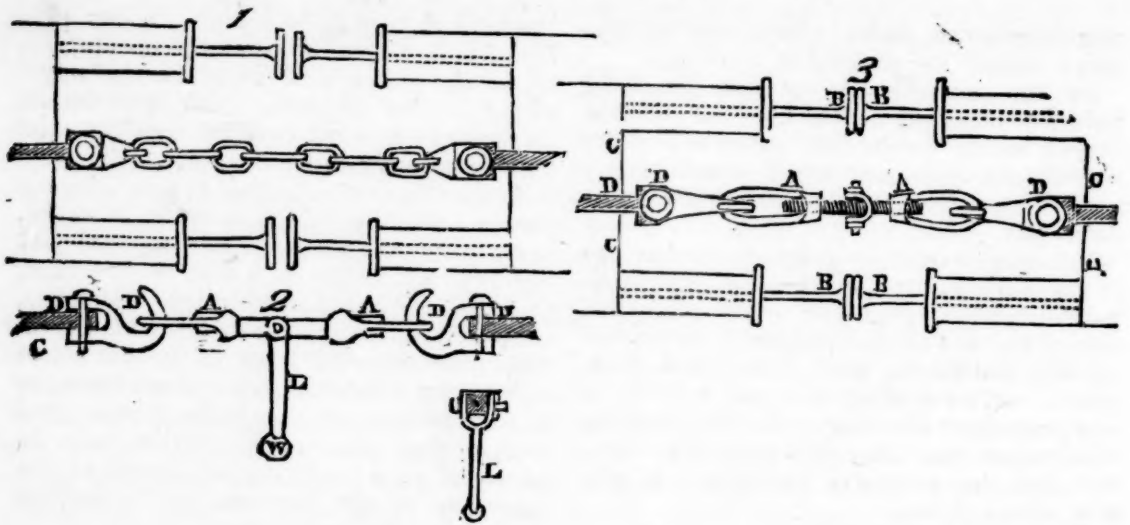
Journal of the Franklin Institute.

From the London Repertory of Patent Inventions.

SPECIFICATION OF THE PATENT GRANTED TO HENRY BOOTH, OF LIVERPOOL, FOR CERTAIN IMPROVEMENTS IN LOCOMOTIVE ENGINES AND RAILWAY CARRIAGES. SEALED JANUARY 23, 1836.

My improvement applicable to railway carriages I declare to be a new mode of connecting the carriages together, by which is effected an increased steadiness and smoothness of motion at high velocities, and which consists in an improved connecting apparatus, by the action of which the buffers of the separate carriages of a train held in contact with each other, so as to prevent that independent lateral and serpentine motion, which railway carriages moving at high velocities assume when they are attached together in the usual way by a simple draw chain.

Description of the Drawing.—Fig. 1, shows the mode in which railway carriages have usually been attached to each other by a simple chain, the buffers of one carriage not coming in contact with those of another.



er, but each carriage being allowed, when moving onwards, a lateral oscillating motion.

Figs. 2 and 3, show the improved mode of connection for which I claim my patent. A, is the connecting chain attached to the draw bar of each carriage, and consists of a double working screw (working within two long links or shackles,) the sockets of which are spirally threaded to receive the screw bolts which are fastened together by a pin and cotter—so that by turning the arm or lever, z, of the said screws, the connecting apparatus is lengthened or shortened at pleasure, to the extent of the long links or shackles above alluded to, in which they work. This screw chain being placed on the hooks, or turned up ends of the carriage draw bars (D), the buffers (B) of each adjoining carriage being first brought close or nearly close together, the lever (z) is turned round a few times till the draw bars (D) are drawn an inch or two beyond their shoulders, on the face of the carriage frame (C), stretching the draw springs (to which the draw bars are attached), to the extent of a fourth or fifth part of their whole elasticity; and by that degree of force attaching the buffers of the adjoining carriages together, and giving by this means, to a train of carriages, a combined steadiness and smoothness of motion at rapid speeds, which they have not, when the buffers of each carriage are separate from those of the adjoining carriage. W, is a weight to keep the lever in a vertical position and prevent the unscrewing of the chain when in action.

Now I do not claim as new the separate parts before described of the buffers, screw chain, or draw-bars, attached to a draw spring, but I claim the combination and joint action of those parts as described, and the consequent close, but elastic attach-

ment of the carriages to each other, which constitutes my improvement applicable to railway carriages.

And my improvement applicable to the locomotive engines which draw the railway carriages, I declare to be a new mode of checking the speed of the engine, or stopping it altogether, which is effected by introducing a throttle valve, slide, or damper, into the exhausting steam pipe of the engine, commonly called the blast pipe, which is usually placed in the chimney, in front of the engine; and which throttle valve may be most conveniently introduced where the two exhausting pipes are united into one, below the place where the pipe is contracted in area for the purpose of producing a blast to the furnace. From the throttle valve must proceed a rod or long handle extending through the chimney to the back part or the boiler, so as to lie within convenient reach of the engine-man, who by moving the said handle, can close the slide or throttle valve, either partially or altogether as may be required. And the throttle valve need not be altogether steam tight, but should be made to work freely in its place. The engine-man when he wishes to stop or slacken the speed of his engine, closes or contracts his throttle valve without shutting off the steam in its passage from the boiler to the engine. The pistons, by that means, are speedily, but not suddenly or violently checked, and the driving wheels of the engine no longer revolving, or revolving very slowly, the engine is soon brought to a stand. Now I do not claim as new, any particular kind of throttle valve, which may be left to the judgment of the engineer, provided it be so constructed that when open the steam way be not contracted, but may allow the steam to escape freely as if no valve or damper were introduced. But I claim the introduction of a throttle valve, or

damper, into the exhausting steam-pipe of a locomotive engine, by closing or contracting which the engine-man can check or stop his engine at pleasure. In witness whereof, &c.

Enrolled March 21, 1836.

SPECIFICATION OF A PATENT FOR AN APPARATUS, AND MODE OF USING THE SAME, FOR RAISING VESSELS FOR THE PURPOSE OF REPAIR. GRANTED TO RUFUS PORTER, BELLERICA. MIDDLESEX COUNTY, MASSACHUSETTS, NOV. 14th, 1835.

Four square timbers eighty feet in length, are placed parallel to each other, and so arranged that the space between each pair is ten feet, and the whole breadth across the four is forty feet. Across these are placed, at equal distances, seventeen other timbers, forty feet long, being firmly secured to the first four by tree-nails, and over these last is placed a strong plank floor; the whole constituting a stage, or platform, eighty feet in length, and forty in breadth. This platform rests on four square trunks, each being thirty feet long, ten feet wide and ten feet deep. These trunks are constructed of framed timbers and plank, and are closed and made water tight on all sides, except an open space of ten feet in length, by four in breadth, in the centre of the bottom of each, and are placed under the four corners of the platform, between the long timbers above mentioned, so that only the cross timbers rest on the tops of the trunks. The platform is further supported by braces extending diagonally from the sides to the trunks, and also connected by iron rods crossing from one to the other. The platform and trunks, which thus connected, I call the elevator, being put into the water, or rather having been constructed afloat, a sufficient quantity of stone is placed on the iron rods to cause the whole to sink when filled with water.

Two scows, each eighty feet long, and eight feet wide, are kept in attendance, one of which floats over each side of the elevator; and ropes being attached to the four corners of the elevator, or to arms projecting therefrom, are also made fast to the bow and stern of each scow, thus preventing the elevator from sinking below a certain depth, say twelve feet below the surface of the water. Each scow contains, besides a small steam engine, of one horse power, two hollow cylinders similar to the cylindrical boilers of high pressure engines, each cylinder being thirty feet long, and

thirty inches in diameter. From each of the four cylinders a piece of leather hose extends to one of the four trunks, being firmly attached to each. These cylinders being charged, by the power of the steam engines, with fifteen atmospheres of compressed air, the vessel to be raised is floated between the scows, or if the vessel lays at anchor, the scows may be propelled by the steam power, to a station on each side of the vessel, dragging the elevator with them which is then raised by the ropes until the middle of the floor comes in contact with the keel of the vessel, and is secured in that position by several ropes or chains, which being attached to the sides of the elevator, are made fast to the timber heads of the vessel. Moreover, several chucks, or blocks, previously prepared and connected with the elevator, are placed under the bottom of the vessel to support the same in its position when raised. Then, by means of valves, the compressed air in the cylinders is permitted to escape through the hose into the interior of the trunks, which immediately give them a buoyancy of about seven hundred thousand pounds. But if the vessel thus raised be of such a size as not to require so much power of buoyancy, the compressed air may be instantly shut off, whenever the floor of the elevator shall have risen fairly above the surface of the water.

While one vessel is being repaired, the cylinders are again charged; and when the repairs of one are completed, other valves are opened, which permit the air to escape from the trunks, while the vessel settles readily, but gently, into the water, and the elevator is ready to receive another; thus avoiding the ordinary delay attendant on raising vessels by the usual method.

I claim the construction and mode of using the elevator generally.

RUFUS PORTER.

Remarks by the Editor.—We have been induced to publish the foregoing specification entire, because it describes the thing patented with a directness and clearness which may serve as an example to others. There is nothing extraneous about it, and we could scarcely, therefore, have done any thing like justice to it had we epitomized it in the ordinary monthly list. There is nothing new in the principle of raising vessels by means of air forced into hollow trunks, but the whole arrangement set forth gives a special and distinct and special character to the plan before us, by which it can undoubtedly be sustained.—*Journal of the Franklin Institute.*

From the Journal of the American Institute.

THE DANFORTH, OR CAP SPINNER.

This machine was invented in 1828, by Charles Danforth, a native of Massachusetts, and is probably the greatest improvement on the throstle that has been made since the days of Sir Richard Arkwright. Mr. D. resided at the time in Rockland county, N. Y. He had been employed for a number of years as an operator of cotton machinery, and having had experience on the common throstle as well as the Waltham dead spindle, he was aware that the two greatest impediments in these modes of spinning, were the difficulty of making the flyer exactly balanced, and the drag of the bobbin by the strength of the yarn. He thought if any plan could be contrived to wind the yarn on the bobbin without the use of the flyer, it would enable him to run the bobbin very fast. After some reflection it occurred to him that a bobbin running on a fixed spindle, and circumscribed by a smooth stationary polished ring, suspended from or fixed to the top of the spindle, might produce the desired result.

He accordingly proceeded to make the experiment. He first permanently secured a throstle spindle in the frame to prevent its turning; and after cutting the curls from the prongs of the flyer, rivetted to them a smooth ring which passed round the bobbin. He then turned a groove in the lower head of the bobbin, for the driving band to run in, and having put all together, and put the bobbin in motion, he fixed up his thread, and filled a bobbin without any difficulty.

It was perceived in this first attempt, that the tension on the yarn while spinning was very light, and the yarn wound soft on the bobbin; it was therefore thought that the principle would be good for spinning weft, which requires to be slack twisted. He therefore constructed his first machines for weft, and after making various experiments, fixed on the present mode of making and supporting the stationary ring, which is a cap similar in shape to an inverted tumbler, with a polished steel ring on the bottom, having a conical socket in the top, made to fit a small cone on the top of the spindle.

The spindle is of sufficient length to admit the bobbin to traverse its length on it, and is secured to the spindle rail at the bottom. It was found that the bobbin, which

is of wood, running at the rate of 7000 revolutions per minute, on a fixed spindle, was apt to get dry, make a loud noise, and cause the bobbin to wear:—to obviate this difficulty, a warve was made, with a tube on the top of sufficient length to pass through the bobbin, on which the bobbin is placed and revolves with it; this warve takes the friction off the bobbin, and as it is made of metal, is durable, and runs without noise.

Mr. D. has patented his invention in this country, and caused patents to be taken in England, and other European states.

This mode of spinning has now been thoroughly tested, both for warp and weft, and is found to be capable of producing full 40 per cent. more yarn, on counts or numbers, from No. 14 to 50, than any other mode heretofore known. It is generally approved of by the spinners who have tried it, and has gone into use, both in this country as well as Europe, more rapidly than any other improvement in spinning has before been known to do.

The principle is such, that instead of making the thread drag the bobbin, the bobbin is made to drag the thread, and the resistance of the atmosphere, together with the slight friction on the lower edge of the ring, produces that retardation necessary for winding the yarn on the bobbin, in consequence of which the tension on all the threads is perfectly uniform, and at the same time delicate, giving a great uniformity and elasticity to the yarn.

This machine requires much less power to drive it than the common throstle.

They are made and sold by Messrs. Godwin, Clark & Co., at their shop in Patterson, N. J., who are the proprietors of the patent, and manufacturers of all kinds of cotton and woollen machinery.

We were once in want of a similar capillary gas tube to that mentioned in the following extract from the London Mechanic's Mag. We had not the means of constructing it but give the plan for the use of our readers.

Two concentric bars slightly conical are to be made to fit each other perfectly (somewhat after the manner described in the 2nd method below). By means of a screw or any other convenient apparatus, the exterior cylinder is to be raised from the interior one,

and immediately an opening varying at pleasure from 0 up to the largest aperture required. This opening, however, is continuous, and a flame from such a tube would present a most beautiful appearance.

The ease with which such a tube could be made and the advantage of varying the size of the aperture, present improvements of some benefit.

It may be remarked that either tube may remain fixed while the other moves.

It would also be easy to construct a gas valve on the same principle.

METHOD OF MAKING CAPILLARY TUBES IN METAL.

For gas-burners, for the safe combustion of mixtures of oxygen and hydrogen, and for other purposes, it is often desirable to divide the end of the discharge-pipe into fine capillary tubes, of the depth of half an inch or more. It is difficult and expensive to bore such apertures in a piece of solid metal, and it is hardly possible to be executed at all, if the apertures are required to be of very small diameter.

Two new methods of producing such capillary tubes have been communicated to the Society of Arts—one by Mr. J. Roberts, of Queen street, Cheapside, and the other by Mr. Henry Wilkinson, of Pall Mall—which are thus described in the last part of the Society's Transaction:—

Mr. Robert's Method.

"Mr. Roberts very ingeniously and expeditiously subdivides the end of a metal pipe into small tubes of any required depth, by means of pinion-wire. Pinion wire is made by taking a cylindrical wire of soft steel, and passing it through a draw plate of such a figure as to form on its surface deep grooves in the direction of radii to the axis of the wire; the ribs which separate these grooves from one another may be considered as leaves or teeth, and of such wire when cut into proper lengths, are made the pinions used by watchmakers.—Hence arises the name by which this wire is commonly known. If now a piece of this wire be driven into the end of a brass pipe of such a size as to make a close fit with it, it is evident that that part of the pipe has thus been subdivided into as many smaller tubes as there are grooves in the wire. By using a draw plate fitted to make smaller and shallower and more numerous grooves than are required in common pinion wire, it is manifest that wires or cores may be produced, which, when driven into

metal pipes, as already described, will subdivide them into capillary tubes of almost any degree of tenuity."

Mr. Wilkinson's Method.

"In the course of some experiments on artificial light, which I was engaged in about twelve months since, I was desirous of obtaining a great number of extremely minute apertures for a gas burner; and, finding it impossible, in the ordinary way, to obtain them, a new method occurred to me, which immediately produced the desired effect. I showed it at the time to several eminent, scientific men, who were unable to conceive how these apertures were formed; and, as I made no secret of the method, they were equally pleased at the simplicity of the operation; and the specimen herewith sent has been exhibiting at the Gallery of Practical Science for several months. I did not attach much importance to it myself; but, as I do not find that it is at all known, and now think it might be useful in a variety of ways, I have sent it for you to lay before the Society; and should they be of the same opinion, I shall feel much pleasure in communicating the mode of operation, by which any number of apertures, hardly visible to the naked eye, and of any length (*even a foot if required*), may be made in any metal in *ten minutes*!

"The process consists merely in turning one cylinder to fit another very accurately, and then, by milling the outside of the inner cylinder with a straight milling tool of the required degree of fineness, and afterwards sliding the milled cylinder within the other, apertures are produced perfectly distinct, and of course of the same length as the milled cylinder. A similar effect may be produced on flat surfaces, if required."

IMPROVED PORTABLE FIRE-LADDERS.

Sir,—Mr. Merryweather having just completed a third set of his improved portable fire-ladders for the Fire-Association of the South-Western District of St. Pancras, the opportunity was taken of making some experiments, particularly with a view to ascertain the effect of my invention of an upper carriage, described at p. 184 of your 22d volume. In the first instance, a simple roller the width of the ladder was attached on the under side, and the relief which was thus afforded in raising the ladders was most surprising.

A pair of small wheels were subsequently applied, when all the irregularities of the brick-work, ridges, window-sills, &c. were surmounted with the greatest ease, and with a rapidity altogether unprecedented.

Thus equipped, three young men joined and raised *seven lengths of these ladders*, reaching upwards of 40 feet, *in half a minute!*

I was previously told that this feat had been repeatedly done on the day previous, but must confess I could not give credit to the statement; my scepticism was, however, completely removed on seeing the experiment performed.

There is one great advantage in employing wheels *permanently fixed* to the first joint of all such ladders as are *stationed in sets*, not yet adverted to, viz: that when the six ladders are strapped together, and standing upright against a wall, &c., with the wheels downwards, they serve to carry the ladders; and thus equipped, one man (supposing it possible a case may occur where no more assistance is at hand) can run off with them to the fire without the least difficulty.

Another addition is about being made to these ladders, for the purpose of assisting such persons as, from fear or infirmity, are unable to avail themselves of the ladders as a mode of escape. A small metal pulley is to be fastened to the wheel-axle at the top of the ladder, a rope passed through which, enables a cradle to be raised to any window of a dwelling, for the rescue of invalids, females, children, &c.

It is with the most unfeigned pleasure, that I notice the attention which this subject has recently received; fire-escapes and improved fire-ladders have been stationed in numerous convenient, situations in many parts of the metropolis, and great exertions are every where making to lessen the number of those calamities, which, in spite of all human efforts, will sometimes occur.

I remain, Sir, yours respectfully,
WM. BADDELEY.

London, April 23, 1836.

[*London Mechanics' Magazine.*]

From the Journal of the American Institute.

GENERAL TALLMADGE'S LETTERS.

The correspondence of General Tallmadge with the American Institute, continues to possess much interesting and useful matter. The letters from which we extract in our present number contain much valuable information on the culture of Silk, to which we beg to refer our country readers more particularly. His first letter is dated at Rome 3d, January last.

He says:—"I fear you may have misunderstood my last letter, and suppose I

intended to speak of the particular Roman cement (so called) which is imported and used in our city. The Romans used two kinds of cement in making their walls; the one the common mortar, and the other the peculiar cement. The one is composed of fine materials, and used for the troughs of their aqueducts. An aqueduct near Tivoli, covered with stone, and laid and pointed with this cement, is now to be seen, after perhaps two thousand years, and is so firm that it will as soon break through the stone as the cement. I intended, however, to speak of the common mortar, used for brick or stone walls. Many of the monuments, as well as the piers and buttments of bridges, were made with marble or cut stone as a casing, and the inside was filled up with fragments of stone, round paving stone or broken brick, filled in with common mortar, or, as I believe masons call it, grout. The casing, or cut stone, has, in most instances, by modern cupidity, been taken off; yet the inside remains standing, or, if fallen down, even yet continues unbroken, in large masses like rocks, and which now can only be broken with great labour. It is worthy of inquiry—how long the buttment of a bridge, or any brick work, in our country, with the outside or casing taken off, would stand exposed to weather and our climate? Do we not too often make such public works not only with insufficient mortar, but also often fill in their centres with common dirt and loose materials, fit only to receive moisture, so that the work soon falls down under the influence of our severe frosts?

This subject is worthy the consideration and correction of our legislature. Perhaps our corporation may more promptly give it their attention. The British parliament have set an example worthy of our imitation. They appoint a commission to investigate any subject of public interest, so that they can legislate more understandingly. The extension of our internal improvements, as well as other buildings, requires that they should be more permanently erected, and the end obtained by inquiry, or other means, will promote the interests of the state.

There is a growing attention on the Continent to the concerns of America, which have hitherto been unknown, or but little noticed. Many of the American newspa-

pers are found on the Continent, and, although not always as discreet in their matter as might be desired, they often impart useful information, and are now much sought after here. The fame of our naval architecture, but more especially of our steamboats and railroads, has spread over Europe, and made our country more advantageously known, than all the other circumstances of our history. Our achievements in these points, and in domestic manufactures, are much spoken of, and furnish many inquiries, and tend greatly to throw light into Europe, and to liberalize its institutions. Steamboats are shortly to be put upon the Danube, and the other principal rivers of Europe, and public attention is universally turned to America, as greatly in advance on these important points.—Whatever has heretofore been the case, Americans are now as much respected and noticed here, as travellers from any other country—and our institutions are more inquired after. A file of the “New York American” is here, giving an account of the exhibition of the late fair of the American Institute, which has attracted considerable attention as an exhibition of the progress of mechanic arts. Although it is the principle of America to offer a full reciprocity in trade and manufactures, and only when this is refused to encourage her own by protecting duties, it is worthy of observation, that France and England are now furnishing a supply of books to prove the impolicy of this American protection, while the practical comment of this free trade learning is felt by travellers in crossing the boundaries of the governments and petty principalities, by repeated searches of their baggage, and the stoppage of articles of manufacture of other kingdoms, and which are in most cases totally prohibited. A bottle of Cologne, in a lady's trunk, is said recently to have incurred a fine of thirty dollars on crossing a dividing line; and all articles of jewelry, unless actually worn at the time, cannot pass with impunity from one Italian state to another; and above all, any Swiss or Italian manufacture of this kind must not enter France, the very source of free trade and anti-protection principles.

I have happened to see several of the *fairs* in England and on the Continent; they are different from ours, as intended not so much for exhibition of fabrics, as for actual

sales of the articles by samples; their goods are exhibited in stores and booths, temporarily erected in the streets. It is essential that the predilection of foreign manufactures should be overcome in our country. From all the observation I have been enabled to make, I have confidence, that in most articles the manufactures of our city and country have arrived to such perfection, that they might now be exhibited, without fear of comparison, with like articles of foreign production.—Would it not be well, at some future fair of the Institute, to provide for an exhibition, in contrast of the foreign and domestic manufactures—and perhaps even to allow temporary booths, during the fair, to be erected for actual sales? This subject seems to be worthy of consideration. The people of Europe are divided into the governors and the governed, and the line of distinction is more strongly marked than you can well imagine; and it is almost incredible to notice, how little the arts and improvements of the present age have been applied, on the Continent, to the concerns and comforts of common life. The condition of society may be inferred from the fact, that there is scarcely a side-walk in the streets of any city on the Continent, saving perhaps some modern ones in a few places in Paris. It is said Russia has lately, and since the Emperor visited England, made side-walks in two streets of St. Petersburg as an experiment. I have not seen one in any town on the Rhine or in Switzerland, or scarcely in Italy;—so little is the regard paid to the convenience of humble condition, while titled greatness can roll in carriages, protected by numerous attendants!—A like parallel could be shown in the absence of very many of the comforts of life so common to the American people. We have great cause to bless our happy lot, while we strive to select, from Europe, any benefits which may be transferred and added to our present stock. The charities of Europe, so much boasted of, are worthy of our study, and are generally more to be avoided than to be adopted. Those of the Continent are more in the nature of hospitals, than as almshouses for the poor. The anatomical museum of Edinburgh surpasses any that I have seen. The surgical preparations at Glasgow are excellent; but, as a whole, perhaps, London equals either,

and certainly surpasses those on the Continent. Of Paris I do not speak, as I have not yet seen it. The medical preparations and the hospital at Rome, are very respectable. At Geneva great regard is had to the ventilation;—so too at Milan, which affords one of the best formed buildings I have seen, and where there is provision for twenty-five hundred beds, of which fourteen hundred were then occupied, in addition to out-buildings for contagious diseases. Florence has a respectable establishment with anatomical preparations in wax-work, more extensive than any I have seen, and with wonderful perfection. This is worthy of imitation. But at Florence is an institution, like to almost every other city on the Continent, and more extensive, for the reception of infants abandoned by, or without parents: windows are provided, by the doors, in which infants can be placed, and a bell rung, so that they may be received, and the person handing them in not be discovered. It is here against the policy to have any of the scrutinizing inquiry, so common in our country, after the parentage of infants, lest it might fix a stain upon monastic purity or titled excellence!—My friend, F. A. Tracy, visited this institution with me, and we were informed, by its principal officers, that they then had 7,000 infants under their care! And we saw so much as to credit the statement.—Begging, in Ireland, is almost universal: on the Continent it is a distinct profession, followed as a calling; and in many places it is greatly overdone, especially at Rome, and said to be worse at Naples. The result of my observations induces me to approve of the hospital charities—greatly to disapprove of those infant establishments, and very much to doubt the expediency of charities for the *healthy poor*. But, instead of leaving them to infest the streets, houses of correction should be provided, and as often as alms are asked, it ought to be followed by an inquiry, and the applicant either to receive care and ample provision for his wants, or be sent to a house of correction. London is now trying this experiment in her principal streets, and has affixed notices requesting persons not to give alms. Observation upon the Italian cities will show the pernicious consequences of street begging. The *cold victual* beggars in our city are a fruitful

nursery of vice, and will soon grow into an uncontrolled fraternity.

I had intended to have written more, but have not time. We start for Naples in the morning.

The next letter, in order, is dated Naples, January 26, 1836.

“The last mail brought us the public prints from Paris, announcing the melancholy fire at New-York, on the 16th of December. It has produced a gloom upon every American face here, and even awakens a correspondent feeling in other foreigners. I have full confidence, however, that the elastic power of our national character will soon rise above this calamity; ‘though severe and extensive—it remains for us to profit by the misfortune.’

I have now been nearly a year in European cities, and have not witnessed, or heard of, a *single fire*! The American Consul, here, informed me yesterday, he had not seen a fire in Naples in eight years!—The walls of the first and second stories of the houses are thicker than ours; and in this we should improve in our city. The stairs are uniformly of stone, and the roofs of tile, and, most generally, the window frames are of stone. The result is, the materials being less combustible, there are fewer fires and less destruction. The *tiles*, at Rome, are *flat*, with an edge raised on each side, nearly half an inch, and narrowed down, so as to lay into each other like shingles.—They are about twenty inches wide, and thirty long: a small rafter, under each edge or course, is laid in mortar; then a semi-circular pipe, laid in mortar, over the double edge or course. It is an excellent roof, and much better than any *tiled* roof I have ever seen with us. The same formed tiles are now found in excavating Pompeii, with the addition, oftentimes, of a moulding or cornice for the eaves of the house. Since the improvements in making our brick, with anthracite coal, such large tiles might well be made for roofs: but, if tin, or zinc, is preferred, I do wish *cast iron rafters* could be used in all and either case. It would not increase the expense, but would add to the safety, and lessen insurance. If cast, one side flat and with an upright centre, it would make them light, and yet of sufficient strength, and afford a groove for the tiles to rest on; the double courses, thus, to be covered by the half pipe; and when pointed inside would be tight, not only as against water, but also wind or snow. The same rafters, with sides reversed, would suit a tin or zinc roof. I have before explained to you, I believe, from Dublin, the importance of cast iron for frames and rafters. The

floors, in Italy, are uniformly of tile or stone; if we, however, continue wooden floors, we shall yet have accomplished much in adopting iron rafters, and thus reject every thing combustible in our roofs. By making stone stairs, and stone or iron window frames, much of the combustible materials now in use with us will be rejected, insurance become less, and fires more easily controlled. It was an ordinance of ancient Rome, that the *basement*, and *first* and *second* floors of houses, should be without wood, and with arches; and it is these arches which now support the ruins.

The climate here is delightful—like our best October. There is little, however, for inquiry, as to improvements useful for our country. The government, or the people, would not suit us, and we perhaps would as little suit them. You can have no idea of the wretched condition of the population, and the state of general intelligence in this city. That class of active, elastic, and intelligent people which occupies our streets, is unknown here. No mind, no information, no inquires or interchange, mark this people; servile grovelling for a miserable subsistence only is aspired after!"

His next letter is dated at Naples, 5th March, 1836.

"Since I arrived in this land of fame and fable, I have not been unmindful of the culture of silk, so justly a subject of great and growing interest to our country. I have visited several manufactories of silk. It is not the season for seeing the silk worm, but most of its progress in other respects I have been able to see. I have made many inquiries in hopes of obtaining useful information. Finizio is an extensive manufacturer of sewing silk; he makes about 3000 lbs. a week, which is most sent to the New-York market. He is an intelligent man, and I found him willing to answer my inquiries; as also were several other establishments, and which mostly confirmed his statement. The sewing silks of Naples are mostly made from the silk grown in *Calabria*, where the worm is fed principally upon the *black* mulberry, and which makes the strongest and best for sewing silk. Finizio stated that the worm fed on the *black* mulberry made the strongest thread; that on the *white* mulberry, finer and better for fabrics; that on the *Chinese* mulberry still finer and more delicate.—When asked if the cocoon from the *Chinese* mulberry required more skilful and delicate work to wind and work it, he said it did, and immediately produced two skeins, one of which he said was from the *black* mulberry, (from a bush, perhaps, eight or

ten feet in circumference,) the other from a bush about four feet. The lesser bush, he said, was less liable to break the thread in winding from the cocoon, and was used in finer silks for fabrics. The *black* mulberry produced a stronger thread, and would bear the larger reel, and was principally used in that business. The silk here is mostly made in the country by families in detail, and much of it reeled there, and in this condition it is brought to market.—For sewing silk it is doubled as often as required, and twisted as much. This process is wholly in a *dark room*. The silk is worked wet, and for this purpose, to preserve a uniformity, the atmosphere is kept damp, the daylight excluded, and the work carried on with small hand lamps. The machine was turned by men harnessed like mules. I have since been out about twenty miles to the silk factory of the king, which is worked by water power, and by which the cocoons are also reeled. I stated to Finizio, as well as at the king's factory, that the Italian sewing silk was sold in the American markets by its weight, while the American sewing silk was sold by the skein; and that one pound of the Italian would have perhaps two hundred and fifty skeins, while one of the American silk would have about three hundred and fifty skeins. The cause of this difference of weight, or why the American sewing silk has a tendency to curl or knot, they could not explain without a sample, but said the weight of sewing silk could be diminished or very considerably augmented in the *dyeing*, and that good dyeing required the silk to be well *boiled* in *soap*, after which it was put into an acid, and was there prepared for the process of the dye, according to the color, as desired. The gloss, or dressing, seems to be produced by beating and twisting on a post, which, with the manual labor put upon its finish, it is supposed prevents its tendency to knot.

I asked if the color of the cocoon, yellow or white, gave any difference of value, or indicated a sickly worm, and the answer was that the color was casual, and the value the same; that a selection of white or yellow cocoons from which to get eggs would probably produce a like color; and Mr. Finizio said he had some customers who had so selected and brought him *cocoons* entirely *white*; and that for white ribbons or fabrics, they commanded a greater price of from three to five per cent., though otherwise of equal value.

I have made many other inquiries and observations on this subject, but which in the limits of a letter cannot be detailed. The eggs are here in market during most of the

year, and by being kept in a *grotto*, or cold damp place, the worm can be produced as required. The *sirocco*, or hot south wind, is here the greatest enemy of the silk worm, and sometimes suddenly destroys so many of the worms as to require the reproduction of another class, from eggs in reserve.—They should be sheltered from this wind, and ventilation should be given them from above or by back windows. I think we have sometimes a like south, or south-west wind, which should be guarded against, and which our gardeners call a *red wind*, from a rust produced by it on peach, and apricot trees, which curls up and burns the young leaves, and often kills the trees, and is said to affect the mulberry trees in like manner.

The black mulberry tree is a native of our country, and is common in Dutchess county, especially in Fishkill. It is, on my farm, a common tree. It is as valuable for posts and timber as red cedar. If the suggestions of Mr. Finizio, and others, as to the black mulberry, are correct, as being better for *sewing silk* and more easily reeled, is not the matter worthy of attention? and especially in the first effort, and until skill and experience is obtained? The *black mulberry* can be immediately used, while a few years will be required to rear the Chinese, and obtain the silk for its more delicate work. My most excellent and lamented wife, in the few last years of her declining health, occupied her active mind in some experiments with the silk worm. She placed some of the eggs in the fall of the year, and left them, during the severe cold of the winter, in an upper chamber; and others she placed in a family room not affected by the frosts; in the spring season they produced the silk worm equally well; she put some eggs in the *ice house*, not on the *ice*, but on the *straw*, and in its atmosphere; and some time, I think, in July, they were brought out, and produced their worms in good condition. She fed one hundred worms on the black mulberry, one hundred on the white, one hundred on the Chinese, and one hundred on the black in their early stages, and, in the last stage, before making their cocoons, upon the Chinese;—all succeeded well. Those fed on the black, seemed to produce the strongest thread and most easily wound; the white the next, with but little difference: those fed wholly on the Chinese no ways different from those fed in the last stage, but greater difficulty to wind the Chinese than either those of the black or white. She had the publications made in our state, as well as those by order of congress on the culture of silk, as her instructions. The impulse

of her mind was to assist in procuring a profitable family employment for children, for females and infirm persons; without which she considered that the noble system of our Sunday free schools and charitable institutions, was not carried to the full extent of their benevolence. The hope of this consummation affords a cheering prospect. A wide field is presented, in which the philanthropist, the moralist, and the political economist may jointly labor, and, in their efforts, greatly promote the public good. Whoever has seen the condition of the common people of Europe, and especially the idle beggars of Ireland and of Italy, will appreciate the indispensable necessity of attention to this growing evil with us. It is a maxim of political economy that "demand begets supply," and experience has shown that every charity is over crowded. The towns of England are holding meetings, and resolving not to contribute to street beggary, but to give tickets on certain officers, who are to examine and afford ample relief to the afflicted, and send others to the houses of correction and confinement. The culture of silk will afford an additional and valuable employment, and should be connected with our charities; and employment of some kind should be provided in the houses of correction, which will be the most effectual charity.

But even as a new staple for the country, and a new article of production in common families, the culture of silk will be an invaluable acquisition. I have made every observation in my power, and I am fully convinced that the culture of silk will be found suitable to our climate, and well adapted to our country and people. Calabria, though south of Naples, is mountainous, and a much colder climate than ours. The Milan and Piedmontese silk is the best; and is much sought after in the London market. Those districts are in the north of Italy, and near the Alps. I think the production of the worm should be delayed until after the usual cold storm to be expected from the 15th to the 25th May. Our month of June would be the most desirable as a first establishment for them. If families can be induced to the growing of the cocoon, the women and children will soon produce as much from the mulberry trees about the house and along the fence, as the father can make on the clear profit of his farm. Thermometers or fires are not much used in Italy, the season giving the temperature required. The business must be simplified, and freed from too much instruction, to secure its success with us. The difficulty to extract reasons or information from the common people of the continent is

so evident, and they so essentially differ from our American people in their aptitude to give reasons and explanations, that I say—do not seek or receive too much European instruction, but rely on the producible common sense of our people; this fund will not fail or be insufficient, and, with a little experience, I am sure of success in the culture of silk in our country. Induce to the growing of the cocoons, and the object will be accomplished. It is a very simple business. I shall continue my observations on this important and interesting subject, in my tour through France; but if our American merchants and dealers in silks from Italy and France, could be induced to introduce the culture of silk, and obtain from time to time information from their correspondents, they would be a host of strength in the business. I have found the *operatives* here rather a prejudiced and uncertain source for information. They work, but cannot tell the why or wherefore."

Our next extracts are from Gen. Tallmadge's letter, dated Paris, April 6th, 1836.

"In my last letter from Naples I believe I promised to say something more on the cultivation of silk. I have since travelled through Italy, and especially in the silk districts, and also through France, and have visited many of the manufactories in both countries, endeavoring to learn the details of this subject, now so interesting, and, I think, so essential to our country. The limits of a letter will, however, confine me to a few isolated remarks.

The weaving of silk after it gets into skeins, is like any other weaving of like character; it is the production of silk, and the habit of growing it, that must be acquired by our country; and it is in this view, a mine of boundless wealth, not second even to the production of cotton. The country which so lately surprised Europe by sending eight bales of cotton to its market, and now astonishes the world with its countless thousands, may soon exhibit a like wonder in the production of its silk.

In Calabria, which is in the south of Italy the black mulberry is principally used. In the rest of Italy the white mulberry, common to them and to France, is principally used. The north of Italy, that is between the Alps and the Appenines, produces the most and the best silk. In this region, and especially in Sardinia, near Turin, and at Novi, the English and French are competitors in market, to purchase their silk as the best in the world; and yet on the 9th of March, the snow was one foot and a half deep, and the streets of Novi blocked up like our Cedar street! In Calabria the silk

is produced by the country people, in their families, and mostly reeled by them. There are very few factories for reeling in the Neapolitan kingdom. In Lombardy, and towards Venice, there are also establishments for reeling, yet the greater part is reeled by the families, in detail, and brought to market in the skein. In Sardinia the cocoons are mostly reeled in establishments. At Novi their reeling establishments are numerous:—I saw one, now erecting, which is a quadrangle two hundred feet square, and appropriated solely to reeling cocoons. They are purchased up from near Milan, and many miles distant. This is admitted to be the best silk in the world. The red mulberry is here principally used, and is known as the Calabria mulberry. It is described as having a dark fruit; the tree is like our black; and when I called it black mulberry, I was corrected, and told the stain of the fruit was red, and not black, and which gave the character of the tree. The French in addition to the white mulberry, have a dwarf white, much liked, and getting into use; but, it must be remembered, there is not in France, and scarcely in Italy, a fence, and they do not graze their fields as we do. With our habit of pasturage, the dwarf would be inadmissible. The Chinese mulberry is unknown in Italy. I found only a few young engrafted trees, but no experiments there, to be relied upon, to establish its superior utility. In Italy, and in France, the mulberry is generally planted near the houses, along the road sides, by division fences, and often like an open orchard. The trees are formed like a middle sized apple tree. Its shade does not injure the land. The tree in Italy is usually made to sustain a grape vine, and the field is cultivated for wheat and other crops. There is less discrimination here than you would imagine in the kind of mulberry. The French have made experiments, especially on the Chinese; and the opinion seems to be, that the Chinese mulberry will bear to have its leaves twice picked off, and thus produce two crops of silk in one year. As yet, however, there is not much use made of the Chinese mulberry, even here, and the grower of silk cannot answer as to its virtues;—but the answer is often given to me, that, as to the quality and the quantity of the silk, it is the same as any other mulberry; and that the quality of the silk depends on the treatment of the worm, and the care and skill in reeling. They pay less attention to the kind of mulberry on which it is fed than we expect. They have also white, and use it. Habit directs more in Europe than with us, and therefore I urge that our people make experiments for themselves. They should neither take nor reject any thing too quickly upon

European experience. Climate and circumstances may produce a different result, and the alleged experiments of Europe may have been incorrectly or inadequately tried.

It is a peculiar and important circumstance in favor of the adaptation and fitness of our climate to the culture of silk, that, with us, the silk worm is produced at the beginning of warm weather, in May and June, by natural temperature of the season, while in Europe, and especially in Italy and France, it is produced only by artificial temperature and means. This fact is a volume in promise for our country. Fires and a thermometer are not used in the south of Italy to secure an equal temperature in the rooms of the worms, nor much used in the north of Italy, unless in the region of some snow capped mountain, or where other circumstances produce sudden inequalities of temperature. It is the same as to the south and north of France.

The books already published, by congress and our state, give the best, and indeed all the instructions which can be given on the subject; and with these, as guides, let the safe and unerring common sense of our people make experiments for themselves: and, I venture to say, the time is not far distant when America will produce silk in abundance from practical information and science, while other countries will continue to do it from habit.

On the continent, and particularly in Italy and France, when about to get out, or transplant, trees or vines, it is the usage to dig the hole about four feet square, and from two to three feet deep; and after thus breaking up the ground, it is left some months to the operation of the air, and to frost. Sometimes manure is mingled with the dirt; and when the tree is set out, the hole is filled to a level. The tree, under such circumstances, takes much firmer root, grows better and holds its upright position.

Grape vines are set out on this principle; but, more commonly, a ditch, or small canal, will be dug, three or four feet wide, and two or three feet deep, and thus open, be left exposed to weather some months. Roots, or cuttings are then planted, and the dirt filled in partially, so as to leave them to take root at least one foot below the level of the surface of the land. As the summer drought comes on, the dirt is hoed about them nearly to a level. The vines are treated upon the same principle. In the spring the ground is hoed away from the stock, so as to break off and prevent the growing of the side and upper roots; course manure is often placed in the hole, about the stock, and in the dry season the dirt is hoed over and about the stock from time to time nearly to a level.

The object and effect of this treatment of the vine is, by inducing the growth of the deep and lower roots to prevent these side and upper roots from running near the surface of the earth, and which, in the spring and wet seasons, produce an excess of growth, and in the dry and summer season fail to sustain the vine, and leave the fruit to wilt and wither, or become imperfect. It is thus the roots of the grape vine are made to run so low in the ground as to allow of cultivation, for a garden or for a wheat crop, without the spade or plough reaching any of the roots of the vine. An equality of growth, in the wet or dry season, is thus in a degree secured; and the uniformity insures the maturity of the grapes. May not this delightful fruit yet be naturalized with us?

The implements of husbandry, in either Italy or France, offer not much for the American farmer. Their lands are mostly cultivated with the spade and manual labour, and when the plough is used, it is the old fashioned plough, on a pair of wheels.— Their crops and their cultivation are so different from ours, that very little can be learned from them useful to us. Silk, wine, and wheat, are their staple productions, and to an almost incredible extent; so it is in France, where the manner of cultivation, and implements of husbandry, are much the same. Wheat is now so abundant in Italy and France, and the price so low, that I found them the other day, at Marseilles, shipping wheat for the New York market! and they would do the same from all parts of Italy, but for their lack of commercial enterprise. Our farmers are now sheltered by a protecting duty, otherwise their crops would moulder in their barns; and even New York be furnished with bread from a foreign market. They have felt secure in their production, and have not regarded, as necessary to themselves, the system of protection for our domestic products. Should peace continue a few years longer in Europe, such is its surcharge of labor, and power of production, that every product of American agriculture will find foreign competition, even in our own markets at home. The wheat, both in Italy and France, greatly surprised me;—the quantity is immense, and greatly beyond my belief till actual observation; and I have travelled eight or nine hundred miles in France, and have no where found sour, dark, or *imperfect bread*. Can we do and say the same in our own country? The bread of France certainly has a decided superiority over ours.

The agriculture of France is in fine condition, and second only to that of England. It has every abundance and the

people appear prosperous and happy.—The *olive* is a valuable addition to the production of Italy and France. Our climate will not, perhaps, favor the tree, at least in the northern states; yet it is of so much value it should be encouraged.—The *olive* can be successfully engrafted on the *ash tree*, and thus, perhaps, it might be acclimated with us. Some such trees, engrafted on the ash, are said to be growing at *Pistoia*, about twenty miles from Florence. There is no inducement, in France or Italy, thus to engraft the *olive*, but the hint is certainly worthy the attention of our nurserymen and of our country.

Marseilles is a delightful city. It has the air and activity of New York, and partakes in a like commercial prosperity. The air of liberty and enterprise in the people appears in strong contrast on coming from Austria and Italy, where the mental and bodily energies of man are, but too certainly, drying up under the jealousy and despotism of absolute monarchies. The harbor of Marseilles gave a zest to our feelings in the exhibition of several American vessels, and which even the ladies of our party readily distinguished from others by their peculiar grace and beauty. Our country, in its vessels, certainly has an unrivalled excellence. I spent a day in the examination of the *Toulon* navy yard and fleet. It is an extensive naval depot, abundantly provided and pretty well arranged. It is, in one sense, the penitentiary or state prison of France. It has four thousand convicts, sentenced to hard labor; and they are allowed to solicit and receive gratuities from visitors. It has several guns intended to fire *bombs on a direct line*; these were shown with some evident exultation; four are allotted to each of the larger vessels. They are well understood by our naval men. There was not any thing else novel or different from other naval depots; and all was of an order and scale from which we have nothing to learn for our service. I was on board the *Monte Bello*, equipped and ready for sea; she mounts 120 guns; her upper decks are so much drawn in as to allow only of carronades, and on slides, for her upper tier. I am sure my national feelings do not lead me into an error, when I say that either our Franklin, or Delaware, seventy-four is equal in force and strength. I was there before our affairs with France were known to be adjusted, and was received and admitted as an American, and treated with kindness and attention.

Great efforts are made in France to advance the condition of its agriculture. It is ascertained that the increased use of the *potatoe* has diminished the consumption of

wheat for bread. The raising of the *beet-root*, for the production of sugar, has, as one of its principal objects, the supplying a new production for the benefit of the farmer.—For the same reason the growing of *madder* is much encouraged, and the production of the *beet* and *madder* come in great relief to agriculture, and are made new sources of public wealth. Our farmer certainly merit the like fostering care and assistance.

I have before mentioned the use of the natural current of the rivers and principal streams of the continent as a water power for manufacturing objects, and I have no doubt but the current in the East river, at New-York, may be used for the same purposes. At *Lyons*, a water wheel is thus turned, and works a forcing pump which drives up the water of the pier about three hundred feet to a reservoir in a public garden; it there forms a *jet d'eau* and falls into a marble basin, which serves as a fountain in case of fire, and its overflow washes the streets. It is attended and worked by one man, and, but for the economy and simplicity of the whole machinery, it might be recommended for adoption at New-York and some of our public squares be thus ornamented and made useful.

The elastic power of our people in rising up from the disaster of the late fire, is cause of wonder and admiration. Their physical energies, and manly efforts in support of commercial credit, have commanded the observation and commendation of Europe.—Our affair with France awoke attention, and the attitude assumed by our country excited admiration and surprise. America is now advantageously known on the continent. Respectable and intelligent Europeans no longer ask where America is, nor inquire the costume and court language of this new people. In every society or circle an American citizen finds demonstrations which afford cause for exulting satisfaction, and increased love of his country. The fame of our success, in naval architecture and steam power, in agriculture, commerce and manufactures, in increasing wealth and universal prosperity, has gone abroad, and the subjects of monarchs are inquiring if there is not some secret magic in the free institutions of America, which works such mighty wonders."

CULTURE OF SILK IN FRANCE, &c.

Since the foregoing was put in type, we have been favored with the perusal of a letter addressed to a member of the Institute, from General Tallmadge, dated Paris, April 12, 1836. As it contains some further suggestions in relation to the culture of silk,

we have asked and obtained permission to make extracts from it. He says :—

"I have in part anticipated your request in relation to the culture of silk, and have written by the previous packet—as also from Naples. In my last letter, when speaking of the planting and culture of the mulberry tree, I fear I omitted to add that proprietors of land often cultivate the mulberry tree with a view to profit from the leaves.—It is common in France and Italy, to sell the leaves to families, who rear the worms, at a fixed rate ; but it is more usual for indigent families to plant a certain number of trees. They furnish the leaves, feed, and take care of the worms, and return to the owner of the land one equal half of the cocoons produced, which is his share of the income, and a most convenient one it is, to be produced from the trees along the road side, and in places which do not injure his agriculture ; and this kind of tenating is of immense benefit to the industrious poor."

"I am proud of the sample of silk sent me in your letter, as made in America by the power loom and have shown it to several.—The patent law of England and France allows its benefits to *aliens*, while our law is confined to citizens or resident aliens. You can therefore get a patent here at pleasure. The French are, like all Europeans, slow in acquiring new habits, or making any changes in their pursuits. From this cause in practice, the different mulberries are not heeded. They have white, from habit, and do not yet use the Chinese mulberry. We have more of the Chinese growing than France and Italy together.

"I have taken pains to obtain from the government some recent information from India, not yet published ; also some recent papers from the National Institute, which, if received, shall be sent out. I attend the public institutions, and especially the weekly meetings of the National Institute and the Agricultural Society, and am much pleased.

"The science and information from the National Institute is important, and from the superior intelligence and adaptation of our people, I am sure we shall in America first practice, and reap benefits from this science. Our advancement is matter of astonishment to Europe, and it is often said to me that we keep a-head of them in all experiments reducible to practice."

In a note it is added that—"The program of the agricultural meeting, containing reports on the proceedings of the last year, I will send by some private conveyance—the medals were given out in my presence.—Our Institute need not blush."

We republish the following letter for the purpose of spreading all available information on the subject—and also with the design of correcting a slight inaccuracy in a late number, in regard to the species of beet employed. We have always felt the importance of this branch of manufacture to our country, and have sought for information from various sources. We are now happy to have it in our power to state, that we shall shortly receive from one of our friends in Europe, a detailed account of the process and machinery, embracing the latest improvements.

From the Boston Advertiser.

BEET ROOT SUGAR.

We have already published an interesting letter from Mr. Isnard, on the subject of the manufacturing of the Beet Root Sugar. We now publish another letter on the same subject, addressed by him to the President of the Agricultural Society, in answer to some inquiries made by the officers of that society, which will be found deserving of notice.—*Daily Advertiser*.

At a meeting of the Board of Trustees of the Massachusetts Society for promoting Agriculture, held 9th April, 1836 :—

The President sent to the board a letter of introduction from Gen. Dearborn to him, (of the French Consul, Mr. Isnard,) with a view to the introduction of the Sugar Beet, and the mode of extracting the sugar.

Voted, That the subject be referred to the President and Mr. Gray.

A copy of the record.

BENJ. GUILD, Sec'y.

In accordance with the above vote, the committee therein named, have had an interview with Mr. Isnard ; and the following interesting letter upon the subject of the manufacturing of sugar from the white, or sugar beet, so called, has been received from him. The committee learning that this subject has of late created conversation amongst the farmers and others, have been induced to give publicity to Mr. Isnard's letter, previously to submitting it to the board of Trustees, whose meeting stands adjourned to the 14th inst. Those of the Trustees to whom said letter has been communicated, approve of its immediate publication.

Sir,—As you have expressed a wish that the cultivators of this country might be generally informed of the principal observations made in France upon the culture of the sugar beet, and also what benefits they might derive by the making of sugar; and for my own part being desirous of fulfilling the promise I made to the public, in my first communication on the above subject, to give further information when called for; I have now the honor to transmit to you the following, which appears to me sufficient for the present, being ready at any time to enlarge on the subject, if required.

The variety of beet to which the sugar manufacturers now give the preference, is the white beet, (*Beta alba*), imported into France from Germany; next to it is the yellow beet, (*Lutea major*.) The first ought to be preferred in this climate, as it stands better against frost and rotting. This variety must not be confounded with another very similar, called in French *Disette*, Scarcity Root, (*Beta silvestris*), also white, though very often striped red and white; this last is a great deal larger, more watery, but deficient in sugar.

The choice of the best beet will not suffice; care ought to be bestowed on the cultivation, in order to enhance and to perfect its saccharine principle, and even facilitate the several processes for obtaining the sugar.

Deep light, rather sandy, but rich soil is requisite to raise an abundant crop of beet of good quality. Beets raised on a field newly manured have proved to contain salts detrimental to sugar, and which increase the difficulty of obtaining it. Good pasture land, not marshy, broken up and planted with beet, produces the most saccharine roots. The transplanting has been discontinued as more expensive, less certain, and the young plants so transplanted producing roots less perfect in shape, a matter of some consequence, owing to the subsequent mechanical operations, those roots are to be submitted to; and also owing to the aptness of the plant so transplanted to rise out of the ground while growing, which causes a great loss to the sugar manufacturer, since it has been proved by analysis that the portion of the root so exposed to light and air, is far from being so rich with sugar as the part which is under ground; hence the necessity of hoeing and earthing

up the roots. Seeds ought to be laid in rows at two feet apart, that distance will allow us to perform the weeding, the hoeing and the earthing up easily, by means of a proper hoe or plough, drawn by a horse, now generally used in France.

The gathering offers nothing particular; care ought to be taken not to hurt the roots; they should be deprived of their small fibrous roots, and also of all the green part of their top to which the leaves adhere.—The stowing of a large quantity of beet deserves the greatest consideration, in order to prevent their heating; for if they vegetate the saccharine principles enter into new combinations, and sugar can no longer be obtained with the same profit.

In Germany the leaves are carefully dried and used as a fodder for cattle. In France the leaves not immediately used are left on the ground as a manure.

The expenses attending the cultivation of one acre of land planted with beet, will vary according to circumstances; every farmer is to judge for himself.

The quantity of beet gathered on one acre will also vary even from 300 to 500 bushels. A respectable farmer of this country has assured me, that 600 bushels would not be considered an extraordinary crop on a rich soil, and with proper management. Nothing in this remark ought to surprise us, for admitting the roots at 2 feet apart, 11,000 roots will be gathered on an acre. The average weight of each may be 3½ lbs. In fact many will weigh as much as 8 lbs. In the following calculations I take for granted 350 bushels as the average crop of one acre, a bushel of beet to weigh 60 lbs.

As to the benefits which a farmer will derive by the cultivation of one acre with beet for the making of sugar, they can be stated as follows:

800 lbs. good Muscovado Sugar valued at 8 cents per pound,	\$64
50 gallons of Molasses, good for distillers, at 16 cents per gal.	8
4 tons of Pumice, a good food for cattle, \$3 per ton,	12
1 ton of dry leaves, or their value as manure,	5

Total, \$89

Owing to the want of skill and experience, I admit at only 4 lbs. the quantity of sugar obtained, though 5 lbs. is generally

obtained, and even some manufacturers obtain as much as 7 lbs. of sugar for every 100 lbs of beet. From this amount ought to be deducted about \$5 for sundry ingredients for manufacturing purposes; also the cost of one cord of wood for fuel. The several operations will be performed by the farmer at his leisure time. The expenses for tools, apparatus, &c. &c., can be valued at about \$120, but should the works be enlarged so as to work a double or greater quantity, those expenses would by no means increase in the same ratio.

Should a company be formed to carry on conjointly the cultivation and the manufacture of sugar on a large scale, other benefits would be derived—1st. By the improving of a large tract of land. 2d. By the refining of the sugar at a trifling additional expense. 3d. By the fattening of cattle. 4thly. Getting the most of sugar at the least expense possible, by being enabled to secure the service of competent superintendents, and by making use of labor-saving machines moved by steam engines; all of which I am ready to demonstrate on application made to me.

In my first communication on this subject, I have stated, that the pumice of beet was a better food for cattle than beet in their natural state; to this assertion objections have been made; allow me, sir, to support my position by a few observations more, inasmuch as they will impart a more correct knowledge of the benefits that can be expected by some new improvement in the process of making the sugar of beet.

By chemical analysis 100 lbs. of beet root prove to contain 85 to 90 lbs. of water, 6 to 11 lbs. of sugar, 1 to 2 lbs. ligenous substance. Pectic acid, albumic, salts, earth, together 2 to 2½ lbs. The greater the proportion of water, the less is the proportion of sugar. The average quantity of juice obtained from 100 lbs. of beet is about 70 lbs.; the weight of the pumice left is 30 lbs. The quantity of sugar extracted from 100 lbs. of good beet by those who are skilled in the process, is now 7 lbs.; but from 1 to 2 lbs. of it is mixed in the molasses; consequently the pumice is proportionably more rich in saccharine principle than the beet. In its natural state the beet holds 85 per cent of water; the juice obtained from it holds 63 lbs. of water; then 22 lbs. of water remain in the 30 lbs. of pumice; consequently in less proportion

than in the beet. This is not all, in the pumice the water is *almost solidified*, as it has been observed, by the pectic acid, which is combined with it, and contributes in a great measure to render the pumice so nutritious; if added to this, that the pumice is easily chewed and better digested, it is not surprising that cattle relish it more than the common beet, and thrive exceedingly well when fed upon it.

The following is fact: the first year I manufactured sugar in France, I offered the pumice for sale, for what milkmen were pleased to give; they soon finding the benefit derived from it, offered more for it than for common beets. Wishing to ascertain what price they were willing to pay for it, I asked as much as one half more than the price I paid for common beet (all by the weight) and yet found a sale for it. They said that 100 lbs. of pumice went further than an equal weight of beet; that they were saved the trouble of washing and cutting them; that when feeding cows with pumice they could save the dry food they were obliged to give them, when feeding them with beet.

Should these observations, for which I beg your indulgence, be in any way deemed beneficial for the promotion of this new branch of agricultural industry in this country, they are, sir, at your disposal for whatever circulation you may be pleased to give them.

I have the honor to be,

With the highest respect, sir,

Your most obedient servant,

MAX. ISNARD,

French Vice Consul for Boston.

To the Hon. L. WINTHROP.

Boston, April 15, 1836.

THE ICE TRADE BETWEEN AMERICA AND INDIA.

The arrival of the *Tuscany* with a cargo of ice from America forms an epoch in the history of Calcutta worthy of commemoration, as a facetious friend remarked, in a medal of *frosted silver*. In the month of May last we received a present of some ice from Dr. Wise at Hughli, (whose efforts have been so long directed to the extension of its manufacture by the native process,) as a proof that the precious luxury might be preserved by careful husbandry until the season when its coolness was the most grateful, little did we then contemplate being able to return the compliment, with a solid lump of the clearest crystal ice at the

conclusion of the rains! nor that we should be finally indebted to American enterprise for the realization of a pleasure for which we have so long envied our more fortunate countrymen in the upper provinces; nay, even the beggars of Bokhara, who in a climate at times more sultry than ours, according to Lieutenant Burnes, "purchase ice for their water, even while entreating the bounty of the passenger." Professor Leslie with his thousand glass exhausters, and his beautiful steam-air pumps, tantalized us with the hopes of a costly treat, and ruined poor Taylor, the bold adopter of his theory; but Science must in this new instance, as on many former occasions, confess herself vanquished or forestalled by the simple practical discovery, that a body of ice may be easily conveyed from one side of the globe to the other, crossing the line twice, with a very moderate loss from liquefaction.

We are indebted to Mr. J. J. Dixwell, the agent of the proprietors, for the following interesting particulars relative to the Tuscany's novel cargo, and the mode of shipping ice from America for foreign consumption.

The supplying of ice to the West Indies and to the southern States of the Union, New-Orleans, &c., has become within these few years an extensive branch of trade under the successful exertions of its originator, Frederick Gudar, Esq., of Boston, with whom S. Austen, Esq., and Mr. W. C. Rogers, are associated in the present speculation.

The ponds from which the Boston ice is cut, are situated within ten miles of the city; it is also procured from the Kennebec and Penobscot rivers, in the state of Maine where it is deposited in ice-houses on the banks and shipped from thence to the capital. A peculiar machine is used to cut it from the ponds in blocks of two feet square, and from one foot to eighteen inches thick, carrying according to the intensity of the season. If the winter does not prove severe enough to freeze the water to a convenient thickness, the square slabs are laid again over the sheet ice, until consolidated and so recut. The ice is stored in warehouses constructed for the purpose at Boston.

The shipping it to the West Indies, a voyage of ten or fifteen days, little precaution is used. The whole hold of the vessel is filled with it, having a lining of tan, about four inches thick, upon the bottom and sides of the hold; and the top lifts covered with a layer of hay. The hatches are then closed, and are not allowed to be opened till the ice is ready to be discharged. It is usually measured for shipping, and each cord

reckoned at three tons; a cubic foot weighs 58½ lbs.

For the voyage to India, a much longer one than had been hitherto attempted, some additional precautions were deemed necessary for the preservation of the ice. The ice hold was an insulated house, extending from the after part of the forward hatch to the forward part of the after hatch, about fifty feet in length. It was constructed as follows:—a floor of one inch deal planks was first laid down upon the dunnage at the bottom of the vessel; over this was strewed a layer, one foot thick of tan; that is, the refuse bark from the tanners' pits, thoroughly dried, which is found to be a very good and cheap non-conductor: over this was laid another deal planking, and the four sides of the ice hold were built up in exactly the same manner, insulated from the sides of the vessel. The pump, well, and main-mast, were boxed around in the same manner.

The cubes of the ice were then packed or built together so close as to leave no space between them, and to make the whole one solid mass: about 180 tons were thus stowed. On the top was pressed down closely a foot of hay, and the whole was shut up from access of air, with a deal planking one inch thick nailed upon the lower surface of the lower deck timbers; the space between the planks and deck being stuffed with tan.

On the surface of the ice, at two places, was introduced a kind of float, having a guage rod passing through a stuffing-box in the cover; the object of which was to denote the gradual decrease of the ice, as it melted and subsided bodily.

The ice was shipped on the 6th and 7th of May, 1833, and discharged in Calcutta on the 13th, 14th 15th, and 16th of September, making the voyage in four months and seven days. The amount of wastage could not be exactly ascertained from the sinking of the ice-guage; because, on opening the chamber, it was found that the ice had melted between each block, and not from the exterior only, in the manner of one solid mass, as was anticipated. Calculating from the rods, and from the diminished draught of the ship, Mr. Dixwell estimated the loss on arrival at Diamond Harbor, to be fifty-five tons, six or eight tons more being lost during the passage up the river; and probably about twenty in landing.—About one hundred tons, say three thousand maunds, were finally deposited in the ice-house on shore; a lower room in a house at Brightman's Ghaut; rapidly floored, and lined with planks for the occasion.

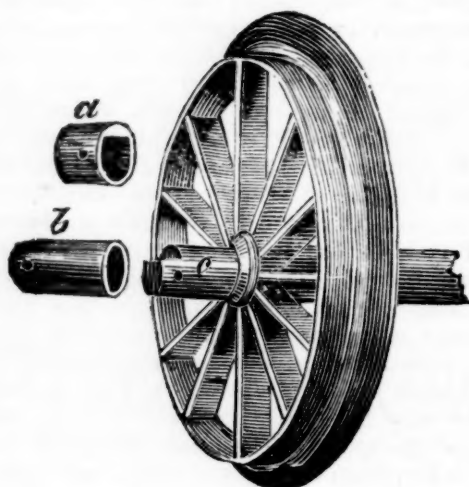
The sale has not, we believe, been so rapid as might have been expected, amount-

ing to no more than ten maunds per diem, although Mr. Rogers has fixed the price at the low rate of four annas per seer, one half of the price estimated for the Hugli ice, which was calculated to be somewhat cheaper in proportion than saltpetre. The public requires to be habituated to it, and to be satisfied of the economy of its substitution for the long-established process of cooling. There may also be some doubts of the best mode of preserving so fleeting a commodity; but on this head we cannot but advise an imitation of the methods pursued on a large scale on board of the Tuscany. For the application of the ice to the purposes of cooling ample directions have been given in the "Gleanings of Science," vol. iii. p. 120. A box or basket, or tin case, with several folds of blankets, or having a double case lined with paddy chaff, or any non-conducting substance, will preserve the ice until wanted; and for cooling water or wine, the most effectual method of all is to put a lump of the clear crystal into the liquid. The next best is to spread fragments upon the bottles laid horizontally, and have them wrapped in flannel for a couple of hours.

So effectual was the non-conducting power of the ice-house on board, that a thermometer placed on it did not differ perceptibly from one in the cabin. From the temperature of the water pumped out, and that of the air in the rim of the vessel, Mr. Dixwell ascertained that the temperature of the hold was not sensibly affected by the ice. Upon leaving the tropic, and running rapidly into higher latitudes, it retained its heat for some time; but after being several weeks in high latitudes, and becoming cooled to the temperature of the external air and sea, it took more than ten days in the tropics before the hold was heated again to the tropical standard.—*London Mechanics' Magazine*.

A new invention for brick making has been patented by one Sawyer. The bricks are made by it from dry clay, and are said to be superior to the common kind in beauty, strength and durability. The texture is much closer than that of the common brick, so that the article absorbs less water, takes paint much better, not requiring more than one half necessary in the old way, and stands fire much longer. The frost likewise does not operate on it, and bricks are turned out of the new machine, at one half the expense, or less, than by any other mode now in use.—[*Pennsylvania paper*.]

RAILROAD AXLE JOURNALS.



The certain and unavoidable destruction of the JOURNALS of Railroad axles renders it necessary, or at least highly important, that a cheaper and more expeditious mode of repairs should be devised than is now in common use. By the ordinary mode of repairing journals, whether by overlaying them, or by splitting and welding in a piece of iron at each end and then turning them down as in their first formation, the expense is, on an average, \$4 for each journal, or \$16 for each car—and this repair must be performed as often as once in four years—it being estimated that the machinery and carriages will require to be renewed every four years.

If this estimate be correct the annual expense will be \$4000 a year on a thousand cars, for repairs of the journals of the axles alone; or \$40,000 per year on a road which, like the Erie railroad, is estimated to require 10,000 cars, and this too in addition to the increased original outlay for cars, in consequence of the additional number required to take the place of those "in the Hospital," for repairs.

Several efforts have been made to reduce this item of expense, yet none, that we are aware of, has succeeded, unless the one referred to in the following account shall be found to succeed. It has been, and is now in use, and thus far to the entire satisfaction, as we are informed, of those who have

witnessed the result of experiments with it on the Baltimore and Susquehannah railroad—and it will, we apprehend, soon be duly appreciated and introduced into general use on all railroads.

This mode of repairing the *journals* of axles, and indeed of all kinds of machinery, will be readily understood, by a reference to the accompanying drawing and description; and it will also be perceived that the repairs can be accomplished, where the axles are *made in the proper manner*, at an expense of a few shillings, certainly *not to exceed a dollar* for each journal, or *four dollars* for each car, and the delay of an hour. Indeed it may be done while the car is loaded, and even on the track, thereby avoiding the trouble of taking the disabled subject to the *Hospital*, which is not unfrequently at the distance of many miles from where the repair may be required.

It will be observed that this drawing represents one wheel with a part of an axle, shewing the journal prepared to receive the *thimble*, or *ferrule*, *a*, and, *b* representing the two ends of a cylinder, which is of iron, case hardened, or steel, $\frac{1}{8}$ th of an inch in thickness, and made to fit accurately to the journals of the axle *c*, which should be of the best quality of iron. This thimble is kept from revolving on the journal, by the square, as shown in and on the outer end *a* and *c*; or it may be confined by a pin, as shown in *a*, *b*, *c*.

The expense of these thimbles, it will be perceived, cannot exceed 60 to 75 cents each; and the cost of labor in putting them on, a mere trifle, certainly not over 25 to 50 cents.

∴ The *economy* in this item of repairs is a matter of no small consequence—as it will amount, on a *single car*, to at least \$2,50 and probably *three dollars* a year, and on a *thousand cars* to \$3000—and on the *New York and Erie Railroad*, to \$30,000. Yet this is not perhaps its most important feature—its greatest value will be found in the *facility* with which the repair may be made, and the saving in the first cost, from the less number, of cars required.

The proprietor, Mr. D. C. Force resides

at Baltimore, and is now prepared to sell rights to companies to use them, or to manufacture the thimble, as may be desired. Information may also be obtained and the mould examined at the office of this Journal.

SUSPENSION BRIDGE OVER THE NIAGARA.

Our readers must be aware that the crossing of this river at Lewiston, as usually effected by the ferry, is not always safe, and during much of the winter impassable.—The rapid increase of the various towns in the vicinity, the constant travel to the falls, and above all the construction of numerous public works, all having a direct bearing upon this point—have indicated the necessity of a bridge—and independent of considerations of economy, none other is here practicable than a suspension bridge.

The value of suspension bridges has been some time established and numerous works constructed on this principle fully sustain their reputation.

In England the far famed Menai bridge by Telford is the most splendid in the world and of immense utility. The first bridge however, on this principle, was built of iron, over the Tees, at Durham, somewhere about the year 1752. It was intended only for foot passengers. The bridge over the Tweed, at Kelso, was finished in the year 1820. The length was 300, the width 18 feet. The Menai bridge was completed in 1825; its length is 560 feet and width 30 feet. Several other bridges of this description have been more recently erected in England,—and among others that at Dryburg Abbey is celebrated for its extreme beauty.

In France, this mode of construction has been generally established. There is one over the Seine, at Paris, one over the Charente, one over the Dordogne and one over the Rhone.

In Switzerland, the Fribourgh bridge has attracted much attention. It is thrown over the Sarine and its valley, and affords a safe and direct transit instead of the old circuitous and sometimes dangerous road.

The bridge at Geneva has several piers,

and the suspension chains are below the road way.

In the United States many small suspension bridges have been constructed—among the largest are, two over the Monongahela, one over the Brandywine and another over the Merrimack, measuring 244 feet between the points of suspension.

It must be evident to the most careless observer that no situation is so advantageous for a suspension bridge, as a valley or river with high and precipitous banks.—This is precisely the situation most unfavorable to a common bridge, especially as the height above the water has no effect upon the cost or durability of suspension, while it vastly increases the one and hazards the other in the common form, so much so as in many cases to render it impracticable.

In the present instance, besides the depth and rapidity of the river and the height and sudden descent to the water from the banks, the accumulation of ice in winter is alone an obstacle of sufficient magnitude to prevent the construction of an ordinary pier bridge. From a diagram before us we perceive that the length of the bridge from bank to bank is to be 930 feet, the width of the surface of the water being 597 feet. The point selected for crossing is the most favorable that could be found on many accounts.

The estimates and surveys have been made by Francis Hall, Esq., C. E. Two different plans are proposed; one being estimated at \$93,541, the other at \$131,541.

The towers can be built on the bank requiring a less cost for masonry but a greater strength of chain and longer curve, while if they are built at or near the water's edge, their height will be much greater, while the length of the chain will be reduced from nearly 1000 to 600 feet. In either case the height of the roadway will be 125 feet from the surface of the water.

An idea of the strength of this sort of structure may be had from the estimate of the engineer. The heaviest load that can possibly be placed upon the bridge would be cattle covering its surface, and this load

would be sustained at a pressure 358 tons short of that required to produce rupture, at the lowest calculation and after making proper deductions.

The chains are calculated to sustain a strain of over 1000 tons beside the bridge itself, and the suspending rods a weight of 6000 tons including their own weight.

The materials for this bridge can be obtained with ease. The best stone for the masonry can be found on the spot and lime also.

The revenue of this bridge estimated at the present rates will yield a handsome percentage on the capital, while there is no doubt but that the transit at either point will be more than doubled by this increased facility.

So fine a specimen of man's work beside the most wonderful piece of nature's handiwork could not fail to attract universal attention. We have only to recollect the important improvements in progress to be convinced of the absolute necessity of some such mode of communication. A glance at the map will suffice.

We understand that the subscription books are open at Lewiston, where Mr. Amos S. Tryon will give any information that may be desired.

While speaking of suspension bridges, we may remark, that we have in our possession much information on this subject including the descriptions in detail of the most remarkable constructions. This is, however, in a form inaccessible to very many. From it could be translated and compiled a volume most useful to the engineer. Should encouragement be offered the work would be undertaken.

SHORT SKETCH OF THE HISTORY OF LOCOMOTION.

We had proposed to ourselves, on this occasion, to give a connected history of this subject, short, but still showing facts of prominent importance—with a view to draw attention to the rapid improvements, that have been made within a comparatively short time.

From various reasons we have not been

able to give the attention due to so important a subject. We have, however, prepared a summary of the different steps in the history of locomotion, which we lay before our readers without further comment.

It is a fact as instructing as curious, that for a long time, ingenuity was taxed and severely taxed, to overcome a difficulty that after all proved to be imaginary. It was thought that a locomotive carriage, (or one in which the power originated,) when placed upon iron rails or a common road, would not advance if the power was applied directly to the wheels. Or in other words, the *adhesion* of the wheels, was thought to be insufficient to advance the carriage *even on a dead level*.

In consequence of this supposed obstacle various attempts were made to furnish a *hold* to the wheels.

The first engines constructed with this object in view, were made by Messrs. Trevithick & Vivian. They proposed having *bosses or nail heads* of sufficient size and of proper form to furnish a hold to inequality purposely made, in the surface of the wheels.

In 1811, Mr. Blinkensop obtained a patent for a rack rail—the wheels of the locomotive being furnished with corresponding cogs.

In 1812, Mr. Chapman obtained a patent for advancing a locomotive by means of a chain extended over the whole line and fastened at the ends. This chain was passed once around a grooved wheel which was moved by the engine, the resistance offered by the chain which could not itself advance, caused the engine to move.

In 1813, a contrivance, often mentioned as an instance of great ingenuity, was produced by Mr. Brunton. In this machine, an apparatus, similar in construction and motion, to the legs of an animal, was moved by the engine. In fact it was a locomotive walker, pushing along the engine, &c.

These contrivances are familiar to most persons, and therefore do not require a more extended notice in this article. They were entirely superseded in the year 1813, by a discovery of singular merit. In fact,

Mr. Blackitt, (who had failed in the employment of some of the above named engines) *actually discovered that the adhesion of the rails and wheels was sufficient to propel, not only the engine, but a weight of some amount after it.* Though this may appear to us, a somewhat left-handed discovery, yet there is no doubt, but that to this gentleman belongs a vast deal of credit, for successfully establishing the fundamental principle of locomotion.

The first experiments on this subject were made upon the Wylam railroad, and the amount of adhesion ascertained by manual labor. The first engine said to have been used upon the road, had but one cylinder, and a fly wheel, to regulate the motion. As may be supposed, this was but a troublesome affair, moving steadily—by jerks. What a contrast with our complete machines of this day!

From this period, however, rapid advances were made, and the locomotive engine began to work its way into favor.

In 1814, Mr. Stephenson constructed an engine, with two cylinders, in which the cranks were placed at a right angle, the one to the other, so that both were not at a dead point, or in full power, at the same time. This was effected by an endless chain, having iron cogs on the axles—and maintained a more equal motion. The chain was finally abandoned, and simply a straight connecting rod substituted.

This engine was able to draw on an edge rail, ascending 1 in 450, 30 tons, exclusive of its own weight, four miles per hour.

Other improvements were afterwards made, and among them was the one dispensing with the use of cogs, in communicating power to the wheels.

The next important point in the history of locomotives, is connected with that of the Liverpool and Manchester railroad.

There was a division of feeling among the directors, some in favor of stationary engines, while others desired locomotives.

Messrs. Stephenson and Lock, and Messrs. Walker and Rastrick, were employed to collect information on the subject. From the report, and information furnish-

ed, the directors were more at a loss than ever. Meanwhile thousands of projects were poured in upon them.

There was, however, some partiality shown to locomotives; and to settle the question, the directors offered £500 for the best locomotive engine, the trial to be before proper judges, and certain conditions to be fulfilled. Among them, we insert the 2nd article.

"The engine if it weighs six tons, must be capable of drawing after it, day by day, on a well constructed railway, on a level plane, a train of carriages of the gross weight of *twenty tons*, including the tender and water tank, at the rate of ten miles per hour, with a pressure of steam in the boiler not exceeding 50 lbs. on the square inch."

Let the reader recollect that this was in 1829—seven years ago!

The offer of this reward brought out several engines, of the result of the experiments, and their effect in determining the directors in favor of locomotive engines, our readers are well aware.

The most successful engine was the Rocket, of Mr. Stephenson; the distance was travelled at rates varying from $11\frac{1}{2}$ to 29 miles per hour. The great merit of this engine was owing to tubes inserted in the boiler, as is now universally practised—this was the invention of Mr. Booth, Treasurer of the company.

Many engines were made for this road, several still retained by the company, after having been crowded out by more improved machines, before they had had time to wear out.

On the Sutton and Whiston inclined planes, rising 1 foot in 96, or 55 feet per mile, the use of stationary power was contemplated. We find, however, that in June, 1830, about the time of the public opening of the road, a weight of 33 tons, (including tender), was carried up the Whiston plane, by the Arrow, assisted by the Dart, at a speed of 17 miles per hour, decreasing to 4 miles per hour. The same engine, unassisted, drew six tons weight up the plane, at the rate of over 15 miles per hour!—These were considered as fair experiments, and were published, in order to give an idea

of the great power of the engines. In December, 1830, the Planet drew a gross weight of 80 tons up the Whiston plane, "*assisted by other engines*," at the rate of 9 miles per hour!!

Let us leave the old world and turn to the new.

The merits of Locomotives had been for some time discussed in this country, but the data furnished by the English experiments, were adopted as English engines were used. Presently engines were made in this country, and then wonderful stories were first heard of engines doing more than they could do, *according to the English calculations*.

The Baltimore and Ohio Railroad Company, with a most praiseworthy perseverance, brought forward one improvement after another, until some began to doubt the propriety of pushing the matter so far. It is true that, subject as we all are to error, too sanguine expectations have in many instances been entertained, but we have only to do with actual performances and such as have been repeated.

We have no means at hand for ascertaining the particulars of the ascent of plans for sometime back, and in truth, owing to the nature of the surface of our country, whenever great summits were to be overcome, Inclined planes with stationary power were used, and ascents of 45 feet per mile were considered as inadmissible.

The Baltimore and Ohio Company, encouraged by their success, are altering their inclined planes by changing the route, and it is now their intention to cross the Alleghany mountains without using stationary power.

The location of the Erie road, on which it was very desirable to avoid the delay, expense and hazard of using stationary power, brought the merits of locomotive engines into more conspicuous notice than ever.

In the report of the Baltimore and Ohio Railroad Company, published Oct. 1834, it was stated that the "Arabian" had drawn "upwards of 112 tons on a level, at the rate of near twelve miles an hour, and the same weight up an ascent of 17 feet per mile,

on a curve of 1000 feet radius, at the rate of $6\frac{1}{2}$ miles an hour."

From the report of last October, we learn that in "December, 1834, the same engine passed over the plains at Parrs Ridge, ascending $\frac{2}{3}$ of a mile at the average rate of 264 feet per mile, with two cars full of passengers, making with the tender 11 tons, exclusive of its own weight of $7\frac{1}{2}$ tons."

Again, "on the 26 September last, a load amounting to 113 tons, was attached to the Washington, a new engine, on the plan of the Arabian, weighing 8 tons, with a view of making an experiment of the effective power of the Company's engines, on the branch road. With this great weight, the engine travelled to the city of Washington, at a rate, not less at any place, than ten miles an hour, preserving this, the least speed up ascents five and six miles in length, of twenty feet to the mile. The train was several times purposely stopped on the ascending grades, and when the steam was again applied, the engine would steadily regain its previous velocity, and maintain it with apparent ease. The same load was brought from Washington to Baltimore, at the same rate. The average speed was much greater, and upon the level parts of the road, seemed entirely at the discretion of the engineers. The same engine, on a level, exerting the same power, would have drawn 213 tons at the rate of ten miles per hour. During the whole time there was a superabundance of steam. Performances like this are, it is believed, unequalled in the history of Railroads."

This report was published last fall, and these statements were considered, as "putting the best foot foremost." Indeed we have found many who considered that a proper allowance was to be made, in the statement of the facts—not to make the subsequent improvement appears to be too great, we will not take them at their word, but will allow the report to stand as it is.

In the report of H. R. Campbell, Engineer of the West Philadelphia Railroad, presented in October last, Mr. C. asserted that Baldwin's engines on the Columbia road

drew "trains of 20 and 24 cars, containing each three tons of merchandize, up 45 feet grades, at 10 to 12 miles per hour; while engines of English construction, from the works of Robert Stephenson, Esq. the celebrated Engineer, carry up the same road only 14 cars, at the same rate of speed.—This great difference is produced by the superior arrangement, and mechanical application of power to Mr. Baldwin's engine, and not from any difference in the weight and adhesive power of the respective machines."

This statement so contradictory to the general opinion, has drawn out much discussion—and the report of Mr. Seymour of the Erie road, stating the facts as they are to be found on the different roads, were also, "thoroughly analysed."

It is not singular, that surprise should be excited—but that the facts are correctly stated, is certain.

Now, there is an engine on the Columbia road—the "George Washington," weighing only $7\frac{1}{2}$ tons, that has drawn over 15 tons up a plain ascending 369 feet per mile, at the rate of 14 miles per hour.

This same engine, has drawn as much as 119 tons in 22 cars, over this road (which is a most severe one for such trials, having numerous and short curves) with great ease, she not yet having tried her utmost power.

We desire our readers to compare these rapid improvements, and to study carefully the results.

We have omitted many matters of interest in this sketch, it being merely intended to place before the view at once, the most important experiments in Locomotion.

NOTE.—We should have done injustice to that patriarch of internal improvements memory, Oliver Evans, had we omitted mentioning his attempts to establish steam carriages, and his predictions already verified which then brought upon him the suspicion of mental derangement. The particulars are well known to every one.

The following communication on Locomotive Engines is thankfully received, as will be every other one on the subject.

LOCOMOTIVE ENGINES AND INCLINED PLANES.

CITY HOTEL, New-York, Aug. 1, 1836.

DEAR SIR—In reading over No. 27, Vol. 5, of the Railroad Journal, I observed a communication headed Baltimore and Ohio Railroad Experiment, and signed W. L., Civil Engineer, Schenectady.

This publication, I beg leave to observe, gives us rather an unfavorable view of those valuable experiments, and from observing this and some other little misrepresentations, in the Civil Engineer Department, between theory and practice, I have been induced to make the following feeble effort to represent facts in a clear light.

The formula given by W. L. for the computation is correct, but the friction of the wagons he has taken at $\frac{1}{400}$ part of their weight, this must be entirely too small a value for the friction. By the late valuable experiments of Pambour on Locomotive Engines and Railroad Wagons, we get the value of the friction of Railroad Wagons at 8 lbs per ton, assuming this as the friction in my calculation.

The following is a comparative view of the result by the two values of the resistance.

Weight of Engine $8\frac{1}{2}$ tons, load exclusive of the Engine, drawn up an Inclined Plane, ascending 1 ft. in 20 ft., was $12\frac{1}{4}$ tons.

FORMULA.

$$R = W + \frac{b \times}{a}$$

The letters R W b a and x represent the values written after them beneath.

Let R = the load on a level road excluding Engine.

Let W = the load on an inclined road, excluding engine. } drawn up.
Let x = the gross load on an inclined plane.

Let a = denominator of a fraction expressive of the inclination.

Let b = denominator of a fraction expressive of the friction.

Then by substituting these respective values for these letters, and reducing the

equation, I find the load on a level road to be $302\frac{3}{4}$ tons. This load the Engine will be able to draw at the same velocity she drew at $12\frac{1}{4}$ tons up the Inclined Plane at 1 in 20. Mr. W. L. has his load for a level $427\frac{1}{4}$ tons, the difference rests in the different values taken for friction. If the whole weight of the Engine rests on her working wheels the power of adhesion, in favorable weather, would enable her to draw $378\frac{1}{4}$ tons on level, and that, at the velocity she drew the former load on the Plane.

By having $6\frac{8}{10}$ tons weight on her working wheels, she would be able in the like weather to draw $302\frac{3}{4}$ tons the load. I have computed to equalize the given performance, consequently she must have had $6\frac{8}{10}$ tons on her working wheels, else she could not do the above stated work.

But there is nothing impossible in the statement. Certainly Mr. W. L. must have known that $\frac{1}{400}$ was too small a value for the resistance of the rail, and it has been probably used to distort a comparative view of the loads for a level and ascending roads. The other parts of this publication I have partially examined, but on not finding data to base any calculation on, either in it, or the original, signed C. R. W., I have been induced to make a short table of the different loads to suit sundry grades. Thus taking the Engine $8\frac{1}{2}$ tons, and friction 8 lbs per ton.

Ascent in feet per mile.	Load in tons.	Ratio of grade.	Comparative view of loads by \times by ratio of grade.	Ratio of engine.	Engine in tons.
level.	200	—	200	—	—
18.857	95.75	2	191.5	1	8.5
37.715	61.00	3	183.	2	17.
56.572	43.625	4	174.5	3	25.5
75.430	33.2	5	166.	4	34.

The load taken for a level is 200 tons; and there is as much power required from an Engine in ascending a Plane of $18\frac{857}{1000}$ feet per mile, with a load of $95\frac{75}{100}$ t., as with the above load of 200 tons on a level. The comparison for the other lines in the table may be done in like manner, or they may be compared with each other, as each of the horizontal lines requires = power with each other, and with the top line also.

The defect in the load, as seen by the fourth column, is owing to the power expended by the Engine to support her gravity ascending the Inclined Planes.

This result in the above table differs much from Mr. Seymour's assertion that 25 feet ascent per mile only required double traction. Now we see 18³⁵₁₀₀ feet requires more than double traction by once the weight of the Engine. The following table will give us a more clear view for comparison. Thus taking the same values of the foregoing table to express engine, &c.

Ascent per mile in feet.	Load in tons.	Ratio of load.	Load × by ratio of loads	Ratio of loads	Product of ratio of loads by ascent in miles per ft.
level.	200.	—	200.	—	0.00
17.38	100.	2	200.	2	8.69
28.23	75.	²⁰⁰ ₇₅	200.	²⁰⁰ ₇₅	10.586
48.35	50.	4	200.	4	12.090
98.57	25.	8	200.	8	12.315

The explanation of the former table will suit for this, as they differ but little in the progressive grades, and agree exactly in the comparative necessary powers to draw loads up those Planes.

This table shows us that 17³⁵₁₀₀ feet ascent per mile require double traction of a Locomotive Engine, compared with a level road or in other words she cannot draw but half the load up this Plane that she will take on a level at the same velocity; and at 48³⁵₁₀₀ feet ascent per mile she can only draw $\frac{1}{4}$ of the load she will on a level road, also, at 98⁵¹₁₀₀ feet ascent per mile, she can only draw $\frac{1}{8}$ of the load she will on a level road. In all the foregoing the road is understood to be straight. Now if Mr. W. L. can support Mr. Seymour in his assertion of not less than 25 ft. per mile to require double traction, I should be pleased to hear him do so. This mere outward smoothing assertion appears, by a comparison with these tables, (say the least of them) to be vague and full of discrepancy with truth.

In Mr. S.'s communication of the 23d of Jan. last, to the President of the New-York and Erie Railroad Company, he also asserts that a Railroad curving, with a radius of 700 feet, when travelled over at a velocity of 12 miles per hour, merely occasions an

equal resistance with those of an Inclined Planes ascending 18 ft. per mile. Above we see that 18 ft. per mile occasions more than double traction, consequently, by his assertion, a curve of 700 ft. radius in a Railroad, when travelled over at the velocity of 12 miles per hour, occasions an additional resistance of more than an equivalent to draw this load at the same velocity on a straight level road. Certainly the inconvenience of causing double traction is considerable, but when we see it smoothed over, by the remarks that its grade only wants to be flattened 18 ft. per mile, to make it as easy as a straight level road. Let us view for a moment a Railroad in its natural way; when curves are necessary in Railroads it is most generally at the points of, rocks and round low dells and valleys, and one reason for submitting to curves is to avoid the great expense of excavation and embankment.

(To be Continued.)

NICKOLL'S PATENT CONDENSING RAILWAY LOCOMOTIVE.

Sir,—I beg to invite the opinions of your correspondents upon the following proposed improvements upon my plan (*Mechanics' Magazine* No. 635,) for a railway condensing locomotive.

The boiler being constructed and situated as before described and represented, I would substitute in the place of the two equi-angular crank condensing engines, D, two double-acting high pressure engines, with the addition of a condensing apparatus (consisting merely of an enlarged air-pump,) which I would fix in the place of the condenser F; the apparatus in question, together with the hot-water pump, to be worked through the medium of a cross-head and separate cranked shaft, by an eccentric, from the shaft of the engines.

Concerning the refrigerator for cooling the hot water of the condenser, late experiments have convinced me, that to maintain the cooled water, even at the temperature 80° Fah., an evaporating superficies of full 200 feet, per horse power would generally be desirable.

It is not necessary to employ the draft of a furnace, or other means, to produce a

current of fresh air in the refrigerator—for moisture, so far from loading the air with its weight, communicates, like heat, increased expansion and elasticity; consequently, as by reason of the heat and vaporisation of the hot water in the refrigerator, the specific gravity of the air therein would be lessened, so by a little elevation of the eduction air chambers T, the refrigerator would establish a current of fresh air for itself.

With a given quantity of steam, I anticipate about one-twelfth greater effect by the employment of my high pressure condensing, instead of the ordinary high-pressure locomotive; but the steam blast being wanting in the condensing locomotive, the expenditure of fuel might perhaps exceed in a sixth ratio what might be required in an uncondensing locomotive; the ultimate economy, however, (to pass by other well-known inconveniences of the steam blast,) I apprehend to be more than questionable, because of the powerfully exfoliating influence of the very intense heat which the blast occasions upon the thin and oxygensible material of which locomotive boilers are, and, with our present knowledge of metallurgy, must be constructed. Yet, if in no other point of view, assuredly as respects economy in the item of water, the superiority of my condensing, as compared with the ordinary locomotive, may be admitted—first, on the ground of the presumed somewhat more economical application of the steam; secondly, from the cooling influence of successive currents of fresh air upon the hot water of the refrigerator; and thirdly, from the vaporisation of a given weight of water, say of the temperature 100° Fah., (according to what one may infer from lately published experiments of Desormes,) absorbing about one-third more caloric, than steam evolved of four atmospheres elasticity.

I am, Sir, your obedient servant,

J. W. NICKOLL.

STEAM CONVEYANCE BETWEEN PADDINGTON AND THE CITY FOR HIRE.

Mr. W. Hancock, whose perseverance certainly deserves success, commenced running his steam carriages, the "Enterprise" and "Erin," on Wednesday morning last, at nine o'clock, from the station

in the City-road to London Wall; from thence he proceeded to Paddington, and returned to the city. On the first day he performed three of these journeys, on the second, four, and on the third (yesterday,) two, before noon. The average time of travelling over the above ground has been 1 hour and 10 minutes, including stoppages to take in passengers, water, and coke. This is just half the time the horse-omnibusses take in going over the same ground. In the nine journeys performed, the number of passengers carried was 220, averaging about 12 persons each single trip. Mr. Hancock intends to run his carriages regularly the same number of journeys daily, for the present, and very shortly to increase the number.

Lond. Mec. Mag.

ON THE IMMERSION OF COPPER FOR BOLTS AND SHIP SHEATHING IN MURIATIC ACID, AS A TEST OF ITS DURABILITY. BY DAVID MUSHET, ESQ.

The durability of copper for bolts and ship sheathing being an object of great national importance, and as there is no better test of its resistance to waste, than immersion in muriatic acid, the following experiments, made thirteen years ago, will, it is hoped, be found not uninteresting.

Small quantities, presenting nearly equal surfaces of each of the kinds of copper described in my last communication, namely, pure shotted copper of the quality from which brass is made, and shots obtained from unrefined copper, were separately immersed in equal weights of muriatic acid. The immersion having been continued for 48 hours, the acid was poured off, and the copper washed repeatedly, and thoroughly dried. The pure copper had lost at the rate of $5\frac{1}{2}$ grains in 100. But the unrefined copper, on being weighed, seemed to have gained half a grain; so that either a mistake must have been made in the weighing, or else a portion of unexpelled moisture had remained in the porous flakes of the copper.

Six ounces of unrefined copper were mixed with three times their bulk of charcoal, and exposed for six hours to a high heat of cementation much beyond what in the absence of the cementation would have sufficed to melt the copper. The flakes of

copper were found surrounded by the charcoal, welded together without fusion, and soft and extremely flexible. Six ounces of the pure copper shots were treated in a similar manner, but the result was so far different that no adhesion of the masses had taken place, and the only perceptible change was a slight cracking or bursting upon the surface of the spheroids, which may be considered as a prelude to fusion. Both results were melted down with charcoal and run into iron moulds. The unrefined copper, when cold, was the strongest and softest; a bar of it, about $\frac{3}{8}$ ths of an inch thick, cut easily across with a knife, and in color and general appearance it very nearly resembled Swedish copper. Another piece was flattened out thin when cold for the purpose of immersion in the muriatic acid. The pure copper was melted in rather a higher degree of heat, and although not teemed until it had assumed a creamy surface, and the crucible had fallen to a low red temperature, it was crystalized throughout the whole fracture. The surface and the fracture of this copper were of a red color; the body weak, and tearing with facility into pieces. Fragments for immersion were cut off and flattened.

The following specimens were then placed separately in muriatic acid.

No. 1, Pure copper, cut off with a chisel,	53 grains
2, Ditto, flattened,	30 —
3, Unrefined copper, cut off with a knife,	39½ —
4, Ditto, flattened, in which stuck a minute portion of the knife,	45 —

On the morning of the third day the following remarks were made upon their respective solutions:

No. 1, Light green color, very transparent when dashed against the sides of the glass. No. 2, equally transparent, but the green was brownish and not so decidedly cupreous. After continuing the immersion for 48 hours longer, the acid was poured off and the specimens were well washed and dried.

No. 1, That weighed 53 grains, now weighed 39½ grains.

Loss 13½ grains, equal to 25.4 per cent.

No. 2, That weighed 30 grains, now weighed 11½ —

Loss 18½ grains. Equal to 61.2 per cent.

No. 3, Unrefined copper flattened, 39½ grains. now weighed, 19 grains

Loss 20½ grains. Equal to 50 per cent.

No. 4, Unrefined copper bar, 42 grains now weighed, 38½ —
Loss 3½ grains. Equal to 8.33 per cent.

It would appear from this experiment that the unrefined copper resists waste in the muriatic acid, in the same way, and to nearly the same extent, as in the cementation with lime mentioned in my last previous paper.

In corroboration of this fact, we may take the following abstract of another series of experiments, wherein the specimens were weighed three times, at intervals of 48 hours between each weighing.

Unrefined copper, 1st immersion,	lost,	15	per cent.
Ditto,	2nd ditto	8 $\frac{3}{10}$	—
Ditto,	2rd ditto	6	—
		<hr/>	
		29 $\frac{3}{10}$	

Pure copper, 1st immersion,	lost	25.4	per cent.
Ditto,	2nd ditto	9.7	—
Ditto.	3rd ditto	11.1	—
		<hr/>	
		46.2	

In favor of the unrefined copper principally containing tin,—16.9 per cent. Two pieces of copper, the one pure, the other unrefined, were immersed, under similar circumstances, for seven days. The unrefined copper lost 17 per cent., and the pure copper 45 per cent. To ascertain whether the greater indestructibility was owing to the tin which remained in the unrefined copper, I formed a bar of alloy as follows:

Pure copper	2880 grains
Block tin	84 —

a proportion of tin about equal to 3 per cent. A piece from this bar weighing about 183 grains was exposed for seven days in muriatic acid, at the end of which time it was found to have lost 30 grains, or 16 $\frac{4}{10}$ per cent. The unrefined copper, above mentioned, lost in the same time and under similar circumstances, 17 per cent., which is a striking correspondence. The

same piece of tin alloy, at the end of five weeks, was found to have lost in all 76 grains, or $38\frac{1}{2}$ per cent. Pure copper by the foregoing results lost in seven days immersion 46.2 and 45 per cent.

In the first instance I was inclined to attribute the indestructibility of the unrefined copper in the acid, partly to the effects of the charcoal in the cementation, seeing that the effect produced by that operation was much greater upon unrefined than upon pure copper. Whatever advantages may belong to the proper use of charcoal in the reduction and cementation of copper (and I consider them not unimportant,) the addition of a small portion of tin will be sufficient to account for the superior resistance to waste which this alloy presents in the muriatic acid, over that of the common refined copper of this country. This incapacity to rapid oxidation which is presented by the alloy of tin with copper, suggests many useful hints to the artists and the manufactures, of which advantage has already been taken in forming ship-sheathing and other articles.—[Lon. and Edin. Phil. Mag.]

GREAT INVENTION.—The Boston Atlas notices at some length the very important invention, by a young man named Cochran, a native of New Hampshire, of what are denominated the "Many chambered, Non-recoil," fire arms. Through the instrumentality of Mr. G. Gay of Providence, now in this place, we were some time since made acquainted with the properties of this wonderful improvement in the construction of cannon, rifles, muskets and pistols—for to all these the invention has been adapted—and should have sooner noticed the subject, but that we were waiting for an actual inspection of some specimen. This opportunity has been promised; and it is expected that one of the rifles, already sent for by Mr. Gay, will soon be ready for exhibition to those of our citizens who feel an interest in the protection of their property upon the ocean, against pirates or hostile savages.

These weapons are so contrived, that by means of a metallic cylinder, or wheel, revolving on an axis immediately in the rear of the barrel, some twelve discharges may be made in rapid succession; insomuch that by a little practice, the loading and

firing of the whole twelve may be performed in little more time than is now required for a single charge and discharge of a common rifle. This wheel is perforated at the periphery, with cavities or chambers, to contain the charges, of a calibre corresponding with that of the barrel; and the charges are ignited by means of percussion caps inserted in a smaller hole at right angles with the above cavity, and striking the centre of the charge. In large ordnance, the wheel or cylinder revolves vertically; but in small arms it has a horizontal motion, with the lock or igniting apparatus underneath. The wheel passes round by means of proper guides, and as fast as each charge arrives opposite the breech of the barrel, it may be exploded. As our description is derived only from verbal testimony, it may not be entirely accurate, or even intelligible; but we are satisfied that the extraordinary effects ascribed to the invention are by no means overrated or misrepresented. Mr. G. informs us that he has discharged several hundred shots from one of the rifles; and after the closest attention he could discern no recoil whatever. The cannon may be discharged easily, twelve times per minute—and a succession of loading and firing may be kept up for almost any length of time. The shot are also driven to a greater distance than by the common method; and a less quantity of powder is used in the process.

Respecting the inventor, who is short of 25 years of age, we have the following particulars, which we abridge from the Atlas: Having obtained a patent in this country, he proceeded to England and France, where his invention was readily patented, after a series of experiments made in presence of distinguished naval and military officers, at London and Paris. The Turkish ambassador, who witnessed the tremendous results, induced Mr. Cochran to go to Constantinople—where he was most kindly received by the Sultan, who loaded the ingenious artist with presents, after ordering a twelve pounder to be constructed on this principle, under the inspection of Mr. C. at the public laboratories, and attending in person, with his whole court, at the trial. Mr. Cochran resided six months at the Turkish capital, receiving the most marked distinction from the government. He then returned to this country, and established a

manufactory at Springfield in this Commonwealth, at which small arms and cannon are now being made, chiefly to order, for sportsmen, &c., or for experiment, by the ordnance officers of the U. States. A piece of brass ordnance is now in course of construction at Troy, and another at West Point, under the direction of the inventor.

Besides the facility and rapidity with which these weapons may be discharged, the rifles, &c. possess many other advantages over all others. There is nothing upon the barrel to obstruct or confuse the sight—the surface being perfectly smooth; they never miss fire, and are little liable to accident. Our whale ships generally carry a number of muskets: but we are persuaded that nothing yet contrived by human ingenuity for security against capture or plunder at sea, can in any shape compete with the implement under notice. We are therefore anxious that ship owners, and others interested at this place, may examine this new and most effectual engine of destruction, and from its peculiar principle of action, judge of its terrific powers. With these deadly instruments, and plenty of ammunition, a single man may disperse a score of pirates, and a small crew contend triumphantly against myriads of barbarians.—[Nantucket Inquirer.]

THE LATE HON. JOHN B. YATES.—We take from the Albany Argus the following extract from the will of the late Hon. John B. Yates. It is quite unnecessary to eulogise the character of a man who dispenses the fruits of a life of industry in the manner which Mr. Yates proposes in his will to do. We should think more favorably of mankind if similar instances of liberality were more frequent:—

THE WILL OF THE LATE JOHN B. YATES, ESQ.

We have been favored with an extract of this will, drawn by the testator himself, and lay it before our readers. It furnishes evidence of that enlarged and philanthropic intellect for which Mr. Yates was distinguished throughout his whole life. A large estate, between *three and four hundred thousand dollars*, over and above a very ample support for his widow, and other legacies, he has set apart for the purposes of literature and science. He has shown, in his dying moments, his regard

for the morality, happiness and character of his country. Indeed, this was his 'master passion, strong in death,' and posterity will enrol his name among its noblest benefactors. During his life, he evinced the same unceasing solicitude for the general good. Aware that the perpetuity of our republican institutions could be best secured by a general diffusion of intelligence, no man was more active in the cause of education than he. The emphatic and no less interesting injunction contained in his address delivered in February last to the State Agricultural Society, exemplifies the deep interest he felt in its cause. These are his words: 'Do you wish, quietly, without injustice and without violence, to equalize property as conducive to the greater safety of the republic? and in fine do you wish to foster any hope to preserve your republic?—educate thoroughly your whole community.' At his own expense he established the Polytechny School at Chittanooga, which was ably conducted, and continued in successful operation ten years.—His financial operations and unremitting exertions, in connexion with his partners, raised Union College from a state of comparative insolvency to that of opulence and distinction. We have no doubt that the legislature of this State will give every aid in its power to promote the great and benevolent objects of the testator, and thus furnish a monument more durable than marble to the memory of its truly patriotic and benevolent founder.

He conveys all his property to Mrs. Yates, his widow, Charles Yates, William K. Fuller, and George K. Fuller, *in trust*; and after providing for certain bequests, he directs as follows:

'I direct further that my said trustees apply the remainder of my property, my real and personal estate, if any there shall be, to the endowment and support of a school embracing literary instruction, combined with the pursuits of real life of every practical description. The institution to be called the *Polytechny*, upon the plan as near as may be, laid down in the memorial presented by me to the legislature of the State of New-York, and the report of a committee and draft of a law founded thereon, during the session of the year 1830. If after winding up my affairs, it shall be ascertained that there are funds sufficient left to commence and found such institution, I then wish my trustees aforesaid to petition the legislature of this State to accept this devise for the object named, to confirm its permanency by a legislative act, and make the necessary arrangement for its uniform and steady government by the appoint-

ment of a Governor or Director, who shall not be liable to removal by the fluctuations of party or the miserable *charlatanry* of political jugglers.

'If such a law to the satisfaction of my said trustees, cannot be obtained in this State, I then direct that as soon as may be, without incurring unnecessary loss, my whole estate left after the legacies and devises be disposed of, on the terms and in the manner that shall be thought most advantageous, and as it shall from time to time be disposed of or sold in such portions as may be offered at the various times, and the money received therefor, that the same be invested until the sum of one hundred thousand dollars be funded, and they are requested in that event to form such an institution in any State which a majority of them please to select, which is willing to give the proper irrevocable legal guaranty for its permanency, and appropriate not less than one thousand acres of land for the purpose. The income only of the one hundred thousand dollars to be applied in this last case to the support of the institution, and the principal to be transferred to the State, and kept by it invested for a school of this description. If afterwards, a greater residuary sum than this shall be realized, I then direct that the balance, not exceeding one hundred thousand dollars, be offered on the same terms to another State, and so on until the whole residuary estate be thus applied and absorbed in amounts not exceeding as above one hundred thousand dollars to each.

Having ascertained with certainty to my own mind, that almost all political men of all parties are more particularly anxious for personal aggrandizement than any permanent arrangements by which the general standard of popular information may be raised, and thus greater stability be given to the political institutions of our country, I am apprehensive of the same secret opposition which I have experienced and which I know exists to every project of the sort. It is therefore my wish that a printing press, and weekly paper at least, devoted to the purpose of advocating literary information among all classes of people, be established, connected with the institution, and that printing and book-binding in all its branches, form a branch of mechanical occupation of a portion of the students in the institution. It is also my will that a professorship of law be established, and that every student be made familiar with the constitution of the United States and each State in the Union, at as early an age as possible, and to be connected throughout with the moral and religious

instructions of the institution. Being also firmly persuaded that the safety of society and its proper moral government cannot be sustained without a high regard for the present legal domestic relations in life, it is therefore my wish that no illegitimate child shall be admitted into the institutions whose parents shall not have legally intermarried, either before or after the birth of the child, and that such prohibition be made a fundamental law of each institution which may be established under this will. If my life shall not be spared to settle my estate myself, and ascertain its value, so as to know accurately what may be left for this purpose, and also enable me to form a more full and detailed plan for the government and management of the institutions, and the specific appropriations for each object, which, from the uncertainty of the amount, I cannot now do, I leave the manner and extent of the arrangements to the sound discretion of my said trustees, in conjunction with my friends John Savage, chief justice of the State, John Van Ness Yates, of Albany, and John C. Spencer of Canandaigua, whom I solicit to aid my trustees by their counsel and advice in organizing and establishing the said institutions.'

EDWARD TROUGHTON, ESQ., F.R.S., L. AND
E., F.R.A.S. AND F.R.S.C.E.

The late Edward Troughton was born in a small village in Cumberland, in the year 1754, where he received merely a common education in the village school. When seventeen years of age he came to London, and apprenticed himself to his brother John, a respectable mathematical instrument maker, carrying on business at No. 136, Fleet-street; and when out of his time was taken into partnership, and ultimately succeeded to the business, and ever after continued to reside there; and it is not a little remarkable, that the same spot has been successively occupied by mathematical instrument makers of celebrity of nearly two hundred years; and here a Sutton, a Wright, a Cole, and a Troughton, labored with unwearied zeal for the advancement of science. In a very short time after Mr. Troughton's arrival in the metropolis, he began to display that great originality of genius, which in the end made all scientific men look up to him for the means of prosecuting their pursuits with the fullest effect—for be it remembered, that the sublime

study of astronomy must ever be obscure without instruments of the most accurate execution, because the theorems of mathematicians are useless without data to act on—and with this he supplied them; presenting to all competent persons the means of *dividing* instruments with the most perfect accuracy, and by which they have been graduated to such a degree of exactness, that error is not to be discovered in them even by high optical powers; and many of his instruments of large dimensions are placed in various observatories, and by them a catalogue of the fixed stars, and the sun, moon and planets, are now ascertained, and published in the *Nautical Almanac*. Many other skillful artists have also acted upon his improvement. The stability, accuracy, and commodious arrangement of his instruments leave nothing for the astronomer but to use them with care, as it is a fact, that the *declination* of some of the fixed stars have been ascertained by them to one third of a second. It is unnecessary to follow Mr. Troughton step by step, but a reference to a few of his great undertakings cannot be without interest. The Royal Observatory is furnished with a mural circle, a transit instrument, and a zenith sector, all of his contrivance; and the last was completed by him when in his 79th year: also, an equatorial instrument, for Trinity College, Dublin; and which is now stationed at Armagh; and a meridian circle (made for Stephen Groombridge, Esq.,) now belonging to Sir James South; the whole of which are specimens not perhaps to be equalled either in beauty or figure, or perfect accuracy. He also remodelled the continental instruments so as to make the repeating circle of the Chevalier Borda, and the reflecting circle of Mayer, almost original inventions of his own. His nautical instruments, also, both as to construction and accuracy, are beyond all praise; and by them the mariner is now indeed enabled "to mark a road on the trackless ocean." Nor were his great labors wholly unrewarded; for the Royal Society, in 1809, presented him with the Copley Medal, for his elegant and valuable paper on *Dividing*. On the 7th of April, 1823, he received the freedom of the Clock Makers' Company; and in January, 1830, the

King of Denmark presented him with a valuable gold medal, as an acknowledgment of his great and important improvements. In his latter years he devoted himself entirely to severe study and scientific pursuit; and labored not merely in abstract theory, but for the improvement and direct benefit of the civilized world. Retaining his faculties to the last, he died on the 12th of June, 1835; and, according to his request, his remains were deposited in the General Cemetery, Kensall Green; and were followed by many, and deeply regretted by all the scientific world.—[*New Monthly Magazine*.]

From the Journal of the Franklin Institute.

EXPERIMENTS ON THE RESISTANCE OF SAND TO MOTION THROUGH TUBES, WITH ESPECIAL REFERENCE TO ITS USE IN THE BLASTING OF ROCKS, MADE AT FORT ADAMS, NEWPORT HARBOR, UNDER THE DIRECTION OF COL. TOTTEN. BY LIEUT. T. S. BROWN, OF THE CORPS OF ENGINEERS.*

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN.—The great quantity of rock excavation required at Fort Adams, Newport, R. I., created, at an early period of the operations, an earnest desire, on the part of the officers of engineers charged with the construction of that work, to devise some method of loading and securing the drill holes which would be less dangerous to the workmen than the one which had been usually employed. For this purpose resort was had to the use of clean dry sand in the manner which will be hereafter described, it being understood that that expedient had been successfully tried at other places. It was found, however, that great prejudices existed among the workmen on this subject, and that from their belief of the inefficiency of the new method, they required to be constantly watched, to prevent them from jeopardizing their own safety, by returning to the old practice of filling the holes with fragments of stones and bricks, driven in with violence above the powder. It appeared to be important that the doubts

*We are compelled to divide this interesting paper. The first part, consisting mainly of a translation of the essay of M. H. Barnard, is now given, and the experiments which form the more important part of the paper, will follow in the next number.—[Com. Pub.]

of the workmen should be put at rest, and that several practical questions connected with the use of sand, in blasting, should be solved, and it was the intention of Colonel Totten, the superintending engineer, that experiments should be made for these purposes. This intention was confirmed by the appearance, in the "*Journal of the Royal Institution*," and in the "*American Journal of Science*," of brief notices, of a paper describing some interesting experiments on the flow and pressure of sand, which had been made in Europe. I was accordingly directed to institute a series of trials, having for their object, to determine the degree and nature of the resistance offered by sand when it is attempted to force it through a tube by direct pressure, and it was intended, at the same time, to investigate, more thoroughly, some of the properties of this substance which were developed in the European experiments just mentioned.

The experiments made in consequence of these instructions were prosecuted at distant intervals of leisure during the year 1829 and 1830, but they were interrupted before all had been accomplished, which had been originally designed; nevertheless, the results obtained were interesting, and it is thought that a brief account of them may be acceptable to the readers of your *Journal*.

Having, subsequently to making the experiments, procured, through the kindness of my friend, Professor A. D. Bache, a copy, in French, of the original paper above referred to, which has been several times re-published in Europe, I have translated it at length, from the "*Annales de Chimie et de Physique*," vol. XL, page 159, and prefix the translation to the summary of my own investigations.

TRANSLATION.

Letter of M. Huber Burnand, to Professor Prevost, on the flow and pressure of sand.

[M. Huber Burnand, two years since, presented to the Society of Physics and Natural History of Geneva, an anemometer, in which the force and duration of the wind, were measured by the quantity of sand which escaped from a variable opening, proportioned in size to the force which it was proposed to measure. On this subject, M. Prevost proposed the following question. Does not the sand in its flow,

correspond in a certain degree with a liquid, and is not its discharge in consequence, more rapid, as the head in the vessel which contains it is greater? He indicated at the same time, the further researches which might be made as to the mode of action of the sand, in regard to the pressure which it exerts. Such is the origin and motive of the experiments submitted by M. Burnand to M. Prevost in this letter, which has been kindly communicated to us for publication.]

By preliminary trials, I ascertained that the two following precautions are necessary to obtain a tolerably regular flow of sand. First, it is indispensable that the sand should be sifted with the greatest care, but that it should not be as fine as flour.—The sand used by founders would be too fine for this purpose; its fall would be irregular and would be frequently interrupted without any assignable cause. If, instead of this, we take the sand used in making tiles, and carefully sift it through a cotton gauze, the holes of which are produced by a web, which presents thirty-eight threads by forty-five in the space of one square inch, we shall find it flow with the greatest facility. The second condition necessary to the uninterrupted flow of the sand, is that the opening should have a diameter of at least $\frac{1}{2}$ of an inch.

These first questions settled, I could proceed to the researches which I had in view. For this purpose, I had made two wooden boxes, one thirty one inches high, with a bottom twelve inches square, and another forty-seven inches high, with a bottom only four inches square. They were open at the top, and provided at the bottom with four small boards, sliding in grooves disposed in the form of a cross, so as to permit the aperture to be widened or lengthened at pleasure.—The slides were made thin, so that the flow should not be affected by the thickness of the wood, a circumstance the inconveniences of which, I had already discovered. These two boxes were raised on four legs, for the convenience of experimenting, and I procured an excellent stop watch to ensure accuracy in the results. The volumes were measured in a graduated glass tube, and I had also obtained a very sensible balance, with very exact metrical decimal weights.—I must add that all my trials were repeated several times, and that I had acquired by long practice, such skill in these experiments, that an error of a quarter of a second in time, would have been detected in the results.

In the most delicate experiments, I introduced metallic slides graduated to $\frac{4}{100}$ ths of an inch, instead of the wooden ones: they

were however, still by no means as exact as was desirable.

I shall divide my researches into two parts; those which have for their special object the flowing of sand, and those which refer more particularly to its pressure, as serving to explain the phenomena ascertained in relation to the first subject.

1. THE FLOW OF SAND.

1. The quantity of sand which flowed in a given time from a given opening, was absolutely the same, both by volume and weight, whatever the height of the sand in the box at the commencement of the experiment. There were nevertheless, occasional variations, more or less, of two or three grammes.* They were caused, most frequently, by the difficulty of introducing and withdrawing, at the proper moment, the vessel which was used to receive the sand.—The errors compensated for each other, and disappeared when quantities as great as from four to five hundred grammes were employed. Three minutes were ordinarily employed in an experiment. The quantities obtained during the consecutive ninety seconds, were weighed, and when the weights were equal we called them accurate.

The weights were placed together, and compared afterwards with others obtained in the same manner, with columns of sand of ten times the height. The results were always perfectly alike.

2. The quantity of sand flowing through a hole from $\frac{1}{8}$ th to $\frac{1}{12}$ th of an inch wide, was always in direct proportion to the length of the opening, a fact which is susceptible of very useful applications in several Philosophical instruments. But the least variation in the breadth of the opening, caused in the quantity of sand flowing out, an increase, which exceeded the simple ratio of the surfaces of the orifice, as far, at least, as I could judge with the imperfect means which were at my disposal.

3. The sand escaping through openings in the side of the box, flowed with the same velocity whatever the height of the column was. But if the holes were placed horizontally, and had not a vertical dimension about equal to the thickness of the board, not a single grain of sand fell from them, whatever its height in the box.

4. Sand poured into one branch of a tube bent twice at right angles, does not rise in the opposite branch as a liquid does; it only extends a very small distance from the elbow into the horizontal part.

6. Whatever may be the pressure to which sand contained in a box is subjected,

it does not influence in any manner, the quantity which flows out through a given opening situated at the bottom of the box or in the sides. The experiment was made successively with masses of iron weighing from twenty-six to fifty-five pounds.

6. A graduated rod inserted perpendicularly in the top of the column of sand, and precisely in the direction of an opening below, descend in and with the sand without inclining in any direction, and with a motion nearly as uniform as that of a clock.—A rod fifteen inches long, was made at pleasure to descend $\frac{4}{10}$ ths of an inch per minute or per second. An overshot wheel placed in the interior of the box, and provided with an index outside, also moved with astonishing regularity, but very slowly. If the rod, instead of being placed in the axis of motion, was placed nearer the sides of the box, it inclined with great uniformity, but at the same time descended and advanced towards the centre with a very slow motion. The velocity of this rod depends, then, principally on its position in the sand, and next on the size of the orifice. The velocity is probably also proportional to the ratio which exists between the surface of the orifice and the horizontal section of the box, since it depends upon the quantity which flows out during each instant, compared with the whole quantity.

With more care and several modifications of the apparatus, it would probably be possible to produce more regularity than I have attained, in the progress of moveable bodies, carried along by the friction of the sand.

I will remark in passing, that there probably does not exist any other natural force on the earth, which produces of itself a perfectly uniform movement, and which would not be altered by gravitation, by friction, or by the resistance of the air. We see that the height of the column has no influence on the velocity of motion of the sand, neither increasing nor diminishing it. As to friction, far from being an obstacle, it is itself the direct cause of the regularity and uniformity of the movement, as will be shown in the sequel of my experiments; and the resistance of the air in the interior of a column of sand in motion, must be very small indeed, since none of the grains fall freely. The hour glass, a time piece, which preceded all others, was thus founded on a much more philosophical basis than has been supposed, and I venture to flatter myself that my researches may be of some use to it, in its application to the arts and to science.

7. After having studied sand in motion, I examined its mode of action when distributed in heaps upon a plane.

*A GRAMME is about 15½ grains.

For this purpose I began by placing isolated grains of sand on a moveable plane, susceptible of being inclined at will; they hardly rolled until the plane was inclined at least, under an angle of thirty degrees, and some remained at an inclination of forty degrees, but beyond this none remained at rest. Sand never assumes a level of itself; the angle, or the angles under which it usually presents itself, after a part of its mass has crumbled, are almost always between thirty and thirty-three degrees; it rarely maintains itself at thirty-five degrees.

In a well sifted heap, the inferior layers, themselves inclined at thirty degrees with the horizon, serve naturally as supports to the superior ones: but the greater part of the weight of these latter, is supported by the portion of the horizontal plane against which they terminate or abut. If we take away this portion of the horizontal plane or bottom, these outer layers immediately roll off, leaving those on which they rested, undisturbed and inclined under an angle of from thirty to thirty-three degrees. This explains why sand does not flow out of a horizontal opening, if the thickness of the body, through which the opening is pierced, is equal to or greater than the height, or vertical dimension of the orifice. In this case the superior layers find points of support on the sides of the containing vessel, and an absolute obstacle in the inferior layers.

Is this property connected with the form of the grains of which the sand is composed? If they had more regularity we might conjecture so, but upon looking at them through a microscope, we see such a variety of figures and dimensions that it is impossible to admit this idea. The greater part of the grains are crystalline laminae, white, flattened and variously terminated; other particles are grey, yellow, brown, &c. with such different forms that they cannot be arranged into distinct classes.

In order to decide whether the form was of any importance in the arrangement of the parts, I tried other substances besides sand, and found that peas or small shot, although with a little more difficulty in forming them into slopes, took nearly the same angle, and followed in all respects the same laws.

II. PRESSURE OF SAND AND OTHER SUBSTANCES COMPOSED OF GRAINS.

1. An egg having been placed at the bottom of a box and covered with several inches of sand was loaded with a mass of iron weighing fifty-five pounds. The result was precisely what I had anticipated; the egg remained unbroken under the great weight which was placed above it.

I repeated this experiment, putting the

sand in motion by means of an orifice at the bottom of the box. The result was the same, whether the egg was placed at the bottom or in the middle of the mass of sand.

These trials proved that the pressure excited by the mass of iron was deflected laterally by the interposition of the sand.— They proved also, that a body placed in a mass of sand, is protected by it as it would be by a liquid, although the sand has a different kind of action from the liquid, on the sides of the vessel containing it.

These conclusions being somewhat paradoxical, I resolved to have recourse to more decisive proof.

2. I took a tube of glass open at both ends, and inserted it, vertically into a small horizontal tube of wood near one end, the other end of this horizontal tube being exactly fitted into a vertical cylindrical box, $\frac{1}{10}$ ths of an inch in diameter and eight inches in height.

I filled this box with mercury, as if it had been the cistern of a barometer; the mercury naturally assumed its level in the vertical tube of glass. Its height in this tube was marked. I then adapted to the box, or cylindrical cistern, a large tin tube twenty-seven inches long, and one inch and one-third in diameter. I filled this large tube with sand, taking care to pour it in very slowly, so as not to agitate the mercury.

Here was a true barometer for measuring the weight of the sand; there was an equal pressure of air on each side, so that apparently nothing prevented the equilibrium between the sand and the mercury. Although I had in part expected the result, I was surprised to see that the sand had added nothing to the weight of the mercury; the liquid kept its level to within $\frac{1}{12}$ th of an inch, a difference which was produced by an accidental shaking of the apparatus during the experiment; for having changed the place of the apparatus, the mercury resumed its level as before the experiment, and preserved it as long as I maintained this state of things.*

I afterwards took the sand from above the mercury; it had not penetrated into the liquid. I substituted in its place dried peas; the large tube was completely filled with them, their weight being more than three pounds. I added an iron weight of upwards of two pounds, and lastly a pressure of the hand as great as I durst apply without endangering the apparatus. The mercury kept its level in the glass tube; not rising $\frac{1}{24}$ th part of an inch. The appa-

* The experiment would have been more simply made with a tube bent like a syphon with parallel branches; but M. Bernand had none at his disposal.

ratus remained several days on trial without any other result. Thus the mercury had not been acted on by the weight of the sand, nor by that of the peas.

This absence of pressure on the bottom of a vessel was still better proved by the following experiments.

3. I took the same tube of tin and suspended it from a very sensible balance; I counterbalanced it exactly, and arranged it so that it reached nearly to the floor. I placed on the floor itself, a small solid cylinder of wood, about two inches high, and a little less in diameter than the large tube, so that the tube inclosed the cylinder, and could play freely in a vertical direction. As the tube was perfectly equipoised, and suspended to the arm of the balance vertically above the small solid cylinder, it moved upwards and downwards along this latter without any sensible friction.

I next weighed out a quantity of dried peas and introduced them into the large tin tube. It lost its mobility instantly, as if it had become more heavy notwithstanding that it had no bottom, and the peas had a solid support on the top of the cylinder of wood.

I afterwards put into the opposite dish of the balance a certain number of grammes successively, until the dish descended, when the tube separated from the cylinder, allowing the escape of the peas which it had contained.

The weight required to raise the tube from the top of the cylinder was within a very few grammes, equal to the weight of dried peas which I had poured into the tube; the difference was not more than twenty grammes, whilst the weight of the peas was more than three and a quarter pounds.—The tube, therefore, appeared to be loaded with all the weight of the peas to which it gave its support.

The experiment repeated with different quantities and with additional weights always succeeded, and often within eight or ten grammes.

But it might be still objected that the lower cylinder had in some way supported the weight of the column. I therefore made the inverse experiment.

4 and 5. In this experiment I fastened the tube by two cords to two supports laterally, and suspended the small cylinder from the dish of the balance, in such a way that being equipoised before hand, it was introduced freely half an inch into the tin tube, and by the least additional weight it fell and permitted the escape of its load.

I then poured about three and a quarter pounds of peas into the tube, and finding that the wooden cylinder, which was per-

fectly free, did not fall, I added a weight of two and a quarter pounds and other weights, without even moving it. It might still be objected, however, that the small cylinder adhered to the sides of the tin tube. To answer this objection, and to render this experiment more striking, I removed the cylinder, and made use of a simple disk of wood of greater diameter than the tube, and supported against its bottom by placing in the balance just weight enough to keep the two in contact. This weight was commonly from ten to twelve grammes.

I then filled the large tube with from three to four pounds of sand, and placed additional weights upon the top of the column, nevertheless the disk retained by the small counterpoise of ten or twelve grammes, did not move. If this same weight of a few grammes had been laid on that part of the disk which projected beyond the tube, it would without doubt have caused it to fall, for it alone retained the disk in its place. A slight touch of the finger, caused the sand to pour from the lower end of the tube, and fall into a basin placed below to receive it. The disk was therefore instrumental in retaining the sand, but did not sustain the weight of it, which was all transferred to the sides of the large tin tube. Ten grammes would have caused the disk to separate from the tube, and since it remained adhering to it, the disk was not loaded with the mass of the sand.

6. To remove all kind of doubt, I gave up the use of the balance, and placing a tub of water near the large fixed tube, floated the disk of wood on the water with the smooth side upwards; I then brought the end of the tube down upon the disk, and poured water into the tub. The disk was pressed by the weight of the water against the end of the tube. I next filled the tube with dried peas but the disk did not move. It, however, was essential in retaining the peas, which without it would have fallen through the tube, but the peas did not press upon it, since a very small force would have sufficed to make them fall from the tube and thus derange the whole apparatus.

7. Leaving every thing in the same condition, I poured water into the large tube; it was kept there with the peas, for a considerable time, until an unforeseen motion produced by the compressed air, which was disengaged from the bottom of the tube, caused the machine to incline. The peas then escaped into the tub, and the water flowed out at the same time. The same trial was made with sand; a considerable quantity of water was poured on the sand, fully impregnating it, and during a very long time it was supported without flowing out.

In another trial made a little differently, the sand took such a consistence with the water, that it caused much trouble to get them out of the tube, which therefore entirely supported the weight of the sand and of the water, together with the force necessary to expel them.

8. We can make these experiments by simply causing the large tube to rest on a small conical heap of sand, whilst it is still suspended from the disk of the balance.—The sand does not escape when the weight put into the other disk is nearly equivalent to the weight of the tube and its contents.

The same trials succeeded with grain: I have repeated them with shot with equal success, although this has a very great weight. They may also be made with a simple roll of paper tied with two small strings; they are then much more striking as the weight acquired by the paper tube contrasts better with its original lightness.

9. I have repeated these experiments with a tin tube widened at the bottom and much larger than the great tube; the result was the same, although there can be no doubt that there is a limit beyond which the sand would receive no further support from the sides of the tube. This will be the case when the inclination of these sides to a horizontal plane is the same as the slope assumed by sand in a heap, that is to say about thirty degrees. I have also repeated several of these trials with a cylindrical tube four inches in diameter, with the same success.

10. From all that I had seen I presumed that it would be very difficult to force sand through a tube even by means of a direct pressure. I made the trial in the following manner. I filled the great tube with sand and laid it in a horizontal position, and with a cylinder of wood, several feet in length, and a little less in diameter than the tube, endeavored to force out the sand at one end by pressing it at the other, but without success. It appeared to me that it would be easier to burst the tube than to move the sand a single inch. The tube being inclined to the horizon about twenty degrees, and the effect being thus aided by the weight of the body, the sand still could not be expelled; the same result followed in inclining the tube in the contrary direction. This explains very clearly why a blast confined with sand is as effectual as any other.

Ynerdub, 15th January, 1829.

P. S. If in the experiment in section 2, under the head of the pressure of sand, we pour water into the tube which contains the peas, the mercury will rise in the glass tube one-fourteenth of the height of the water; a proportion which corresponds with that

of the specific gravities of those liquids.—The water acts as usual, but the peas exert no pressure.

2nd. There is another way of making the experiment with the tube which is within the reach of every body. Procure a tin tube an inch in diameter and as long as is desired, open at both ends. Take a sheet of fine paper and apply it against the end of the tube pressing up the edges with the hand so as to make it take its form; then moisten the edges of the paper with water and cause them to adhere to the sides of the tube. Place the end on the table and fill the tube with sand. Raise it with care, and notwithstanding the slight adherence of the paper, the sand will be sustained while the tube is freely moved about.

3d. It would be desirable to place a vessel of sand provided with an orifice for its escape, under an air pump, in order to determine whether the velocity would be affected by its flowing in a vacuum.

Biblioth. Univ. XL. 22.

(To be Continued)

From the Journal of the American Institute.

INFORMATION TO PERSONS HAVING BUSINESS TO TRANSACT AT THE PATENT OFFICE.

All former acts are repealed by the act passed 4th July, 1836.

"Patents are granted for any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement on any art, machine, manufacture or composition of matter, not known or used by others before his or their discovery or invention thereof, and not at the time of his application for a patent in public use, or on sale with his or their consent or allowance, as the inventor or discoverer."

The term for which a patent is granted is fourteen years; but may, under certain circumstances, be renewed for seven years, as hereinafter mentioned.

Patents are granted to citizens of the United States, to aliens who shall have been resident in the United States one year next preceding, and shall have made oath of their intention to become citizens thereof, and also to foreigners who are inventors or discoverers.

A patent may be taken out by the inventor in a foreign country without affecting his right to a patent here, if the patent is not delayed in this country longer than

six months from the time of taking it out abroad; and any publicity in consequence of such foreign patent does not affect his right to a patent in the United States. A patent is not granted upon introduction of a new invention from a foreign country, unless the person who introduced it be the inventor or discoverer. If an alien neglects to put and continue on sale the invention in the United States, to the public, on reasonable terms, for eighteen months, the patentee loses all benefit of the patent.

Joint inventors are entitled to a joint patent, but neither can claim one separately.

An inventor cannot assign his right before a patent is obtained, so as to enable the assignee to take out a patent in his own name.

The assignment of a patent may be the whole or undivided part, "by any instrument in writing." All assignments, and also the grant or conveyance, of the use of the patent in any town, county, or State, or limited district, must be recorded in the patent office within three months from the date of the same; for which record the grantee or assignee must pay three dollars to the patent office.

All applications pending on the 4th July, 1836, (the time of passing the said act,) on which the duty of thirty dollars has been paid, will be considered as presented under the new act, and will not require a new petition. In all other cases the papers will be returned for correction with this circular explanatory.

"In case of the decease of an inventor, before he has obtained a patent for his invention, the right of applying for, and obtaining, such patent, shall devolve on the administrator or executor of such person, in trust for the heirs at law of the deceased, if he shall have died intestate; but if otherwise, then in trust for his devisees, in as full and ample manner, and under the same conditions, limitations, and restrictions as the same was held, or might have been claimed or enjoyed, by such person in his or her lifetime; and when application for a patent shall be made by such legal representatives, the oath or affirmation shall be so varied as to be applicable to them."

The patent office will be open for examination during office hours, and applicants

can personally, or by attorney, satisfy themselves, on inspection of models and specifications, of the expediency of filing an application for a patent.

All fees received are paid into the treasury, and constitute a fund to defray the expenses of the office: hence the law has required the payment of the patent fee before the application is considered; two thirds of which fee is refunded on withdrawing the petition.

It has hitherto been the practice for inventors to send a description of their inventions to the office, and inquire whether there is any thing like it, and whether a patent can be had. As the law does not provide for the examination of descriptions of new inventions, except upon application for a patent, no notice can be taken of such inquiries.

On the application for a Patent.

No application will be considered until the fee for the patent is paid.

The application for a patent must be made by petition to the *commissioner of patents*, signifying a desire of obtaining an exclusive property in the invention or discovery, and praying that a patent may be granted therefor, as in the form annexed hereto, *which petition should be signed by the inventor.*

Description of Specification.

"Before any inventor shall receive a patent for any such new invention or discovery, he shall deliver a written description of his invention or discovery, and of the manner and process of making, constructing, using, and compounding the same, in such full, clear, and exact terms, avoiding unnecessary prolixity, as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound, and use the same; and in case of any machine, he shall fully explain the principle, and the several modes in which he has contemplated the application of that principle, or character by which it may be distinguished from other inventions; and shall particularly specify and point out the part, improvement, or combination, which he claims as his own invention or discovery."

It is recommended in all cases where the

machine or improvement is complicated, to frame the specification with reference to the drawings.

A *defective description* or specification may be amended any time before issuing the patent.

For a new Improvement.

"Whenever the original patentee shall be desirous of adding the description and specification of any new improvement of the original invention or discovery, which shall have been invented or discovered by him subsequent to the date of his patent, he may, like proceedings being had in all respects as in the case of original applications, and on the payment of fifteen dollars, as herein after mentioned, have the same annexed to the original description and specification; and the commissioner shall certify, on the margin of such annexed description and specification, the time of its being annexed and recorded; and the same shall thereafter have the same effect in law, to all intents and purposes, as though it had been embraced in the original description and specification."

"Every inventor, before he can receive a patent, must make oath or affirmation, that he does verily believe that he is the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement, for which he solicits a patent, and that he does not know or believe that the same was ever before known or used, and also of what country he is a citizen." (See form annexed.)

If the applicant be an alien, and have resided one year in the United States preceding the application, and have given legal notice of his intention to become a citizen of the United States, he must make oath to these facts before he can claim a patent, for the same sum paid by a citizen.

Of Drawings, and specimens of Ingredients.

The law requires, that "the applicant for a patent shall accompany his application with drawing or drawings, and written references, when the nature of the case admits of drawings." These drawings should be according to the rules of perspective, and neatly executed; and such parts as cannot be shown in perspective, must, if important, be represented in section or detail. When the specifications refer to the drawings, duplicates of them are

required, as one must accompany the patent when issued, as explanatory of it, and one must be kept on file in the office.

The drawings must be signed by the patentee, and attested by two witnesses: many drawings have been transmitted without any name or references.

Drawings are necessary, even though a model be sent.

Of Models.

The law requires that the inventor shall deliver a model of his invention or improvement when the same admits of a model. The model should be neatly made, and as small as a distinct representation of the machine or improvement, and its intended properties, will admit; and the name of the inventor should be printed *upon* or *affixed* to it, in a *durable* manner. Many models have been forwarded without a name, and therefore lost or mislaid.

Models must be forwarded at the expense of the applicant.

When the invention is of a "a composition of matter," the law requires that the application be accompanied with specimens of the ingredients, and of the composition of matter, sufficient in quantity for the purpose of experiment.

Proceedings on applications for Patents, and on appeals from the decision of the Commissioner.

"That on the filing of any such application, description, and specification, and the payment of the duty hereinafter provided, the commissioner shall make, or cause to be made, an examination of the alleged new invention or discovery; and if, on any such examination, it shall not appear to the commissioner that the same had been invented or discovered by any other person in this country, prior to the alleged invention or discovery thereof by the applicant, or that it had been patented or described in any printed publication in this or any foreign country, or had been in public use or on sale, with the applicant's consent or allowance, prior to the application, if the commissioner shall deem it to be sufficiently useful and important, it shall be his duty to issue a patent therefor. But whenever, on such examination, it shall appear to the commissioner that the applicant was not the original and first inventor or discoverer thereof, or that any part of that which is

claimed as new had before been invented or discovered, or patented, or described in any printed publication, in this or any foreign country, as aforesaid or that the description is defective and insufficient, he shall notify the applicant thereof, giving him briefly such information and references as may be useful in judging of the propriety of renewing his application, or of altering his specification, to embrace only that part of the invention or discovery which is new. In every such case, if the applicant shall elect to withdraw his application, relinquishing his claim to the model, he shall be entitled to receive back twenty dollars, part of the duty required by this act, on filing a notice in writing of such election in the patent office, a copy of which, certified by the commissioner, shall be a sufficient warrant to the treasurer for paying back to the said applicant the said sum of twenty dollars.— But if the applicant, in such case, shall persist in his claim for a patent, with or without any alteration of his specification, he shall be required to make oath or affirmation anew, and in manner as aforesaid; and if the specification and claim shall not have been so modified as, in the opinion of the commissioner, shall entitle the applicant to a patent, he may, on appeal, and upon request in writing, have the decision of a board of examiners, to be composed of three disinterested persons, who shall be appointed for that purpose by the Secretary of State, one of whom, at least, to be selected, if practicable and convenient, for his knowledge and skill in the particular art, manufacture, or branch of science to which the alleged invention appertains, who shall be under oath or affirmation for the faithful and impartial performance of the duty imposed upon them by said appointment. Said board shall be furnished with a certificate, in writing, of the opinion and decision of the commissioner, stating the particular grounds of his objection, and the part or parts of the invention which he considers is not entitled to be patented. And the said board shall give reasonable notice to the applicant, as well as to the commissioner, of the time and place of their meeting, that they may have an opportunity of furnishing them with such facts and evidence as they may deem necessary to a just decision; and it shall

be the duty of the commissioner to furnish to the board of examiners such information as he may possess relative to the matter under their consideration. And on an examination and consideration of the matter by such board, it shall be in their power, or of a majority of them, to reverse the decision of the commissioner, either in whole or in part; and their opinion being certified to the commissioner, he shall be governed thereby in the further proceedings to be had on such application: *Provided however*, That before a board shall be instituted in any such case the applicant shall pay to the credit of the treasurer, as provided in ninth section of this act, the sum of twenty-five dollars; and each of said persons so appointed, shall be entitled to receive for his services, in each case, a sum not exceeding ten dollars, to be determined and paid by the commissioner, out of any money in his hands, which shall be in full compensation to the persons who may be so appointed, for their examination and certificate as aforesaid.”

Re issue to correct a defective description.

When the applicant wishes to cancel his old patent, for a mistake or inadvertence, he should state the reasons in his application, and expressly surrender the old patent, which must be transmitted to the patent office before a new patent will be issued.— Section thirteen enacts: “That whenever any patent which has heretofore been granted, or which shall hereafter be granted, shall be inoperative or invalid, by reason of a defective or insufficient description or specification, or by reason of the patentee claiming in his specification, as his own invention, more than he had or shall have a right to claim as new, if the error has, or shall have arisen by inadvertency, or accident, or mistake, and without any fraudulent or deceptive intention, it shall be lawful for the commissioner, upon the surrender to him of such patent, and the payment of the further duty of fifteen dollars, to cause a new patent to be issued to the said inventor, for the same invention, for the residue of the period then unexpired for which the original patent was granted, in accordance with the patentee’s corrected description and specification.”

And in case of his death, or any assign-

ment by him made of the original patent, a similar right shall vest in his executors, administrators, or assignees, and the patent, so reissued, together with the corrected description and specification, shall have the same effect and operation in law, on the trial of all actions hereafter commenced for causes subsequently accruing, as though the same had been originally filed in such corrected form before the issuing out of the original patent.

Interfering applications.

"Whenever an application shall be made for a patent, which, in the opinion of the commissioner, would interfere with any other patent for which an application may be pending, or with any unexpired patent which shall have been granted, it shall be the duty of the commissioner to give notice to such applicants, or patentees, as the case may be; and if either shall be dissatisfied with the decision of the commissioner on the question of priority of right or invention, on a hearing thereof, he may appeal from such decision, on the like terms and conditions as are provided in the case of applications for inventions not new; and the like proceedings shall be had to determine which, or whether either of the applications is entitled to receive a patent, as prayed for."

Caveats.

The law enacts, "that any citizen of the United States, or alien, who shall have been resident in the United States one year next preceding, and shall have made oath of his intention to become a citizen thereof, who shall have invented any new art, machine, or improvement thereof, and shall desire further time to mature the same, may, on paying to the credit of the treasury, in manner as provided in the ninth section of this act, the sum of twenty dollars, file in the patent office a caveat setting forth the design and purpose thereof, and its principal and distinguishing characteristics, and praying protection of his right, till he shall have matured his invention: which sum of twenty dollars, in case the person filing such caveat shall afterwards take out a patent for the invention therein mentioned, shall be considered a part of the sum herein required for the same. And such caveat shall be filed in the confidential archives of the office, and preserved in secrecy. And

if application shall be made by any other person, within one year from the time of filing such caveat, for a patent of any invention with which it may in any respect interfere, it shall be the duty of the commissioner to deposit the description, specifications, drawings, and model, in the confidential archives of the office, and to give notice, by mail, to the person filing the caveat, of such application, who shall, within three months after receiving the notice, if he would avail himself of the benefit of his caveat, file his description, specifications, drawings, and model; and if, in the opinion of the commissioner, the specifications of claim interfere with each other, like proceedings may be had in all respects as are in this act provided in the case of interfering applications: provided, however, that no opinion or decision of any board of examiners, under the provisions of this act, shall preclude any person interested in favor of or against the validity of any patent which has been, or may hereafter be granted, from the right to contest the same in any judicial court, in any action in which its validity may come in question."

Extension of the patent beyond the fourteen years.

Section eightenn enacts: "That whenever any patentee of an invention or discovery shall desire an extension of his patent beyond the term of its limitation, he may make application therefor, in writing, to the commissioner of the patent office, setting forth the grounds thereof; and the commissioner shall, on the applicant's paying the sum of forty dollars to the credit of the treasury, as in the case of an original application for a patent, cause to be published, in one or more of the principal newspapers in the city of Washington, and in such other paper or papers as he may deem proper, published in the section of country most interested, adversely, to the extension of the patent, a notice of such application, and of the time and place when and where the same will be considered, that any person may appear and show cause why the extension should not be granted. And the Secretary of State, the commissioner of the patent office, and the solicitor of the treasury, shall constitute a board to hear and decide upon the evidence produced before them, both for and against the extension,

and shall sit for that purpose at the time and place designated in the published notice thereof. The patentee shall furnish to said board a statement, in writing, under oath, of the ascertained value of the invention, and of his receipts and expenditures, sufficiently in detail to exhibit a true and faithful account of loss and profit, in any manner accruing to him from and by reason of said invention. And if, upon hearing of the matter, it shall appear to the full and entire satisfaction of said board, having due regard to the public interest therein, that it is just and proper that the term of the patent should be extended, by reason of the patentee, without neglect or fault on his part, having failed to obtain, from the use and sale of his invention, a reasonable remuneration for the time, ingenuity and expense bestowed upon the same, and the introduction thereof into use, it shall be the duty of the commissioner to renew and extend the patent, by making a certificate thereon of such extension, for the term of seven years, from and after the expiration of the first term; which certificate, with a certificate of said board of their judgment and opinion as aforesaid, shall be entered on record in the patent office; and thereupon the said patent shall have the same effect in law as though it had been originally granted for the term of twenty-one years; and the benefit of such renewal shall extend to assignees and grantees of the right to use the thing patented, to the extent of their respective interest therein: *Provided, however,* That no extension of a patent shall be granted after the term for which it was originally issued."

Fees payable at the Patent Office.

All fees must be paid in advance: the amount is fixed by law, except in the case of drawings, the expense of which will be communicated on application for the same.

Every applicant must pay into the treasury of the United States, or into the patent office, or into any of the deposit banks, to the credit of the treasurer, on presenting his petition, as follows:

If a citizen of the United States	\$30 00
If a foreigner, who has resided in the United States one year next preceding the application for a patent, and shall have made oath of his intention to become a citizen	30 90

If a subject of the King of Great Britain	500 00
All other foreigners	300 00
On entering a caveat	20 00
On entering an application for the decision of arbitrators, after notice from the commissioner that the patent is not new, or interferes with a pending application or caveat	25 00
On extending a patent beyond the fourteen years	40 00
For recording each assignment or transfer of patent	3 00
For adding to a patent the specification of a subsequent improvement	15 00
On surrender of old patent, and new issue for mistake or inadvertence of patentee	15 00
For copies of patents, or any other paper on file, for each 100 words	10
For copies of drawings, a reasonable sum in proportion to the time occupied in making the same	

N. B. The patent office does not make original drawings to accompany applications for patents, and gives only copies of the same after the patent is completed.—Draughtsmen in the city of Washington are always ready to make drawings, at the expense of the patentees.

Communications to and from the patent office are free of postage.

All fees, if sent to the commissioner of patents, should be transmitted in gold or silver coin, when they amount to less than five dollars, as bank notes under that sum will not be received.

It is recommended to make a deposit in a deposit bank, for the fee for the patent, and remit the certificate. Where this cannot be done without much inconvenience, gold may be remitted by mail, free of postage; and this is preferred to the bills of the deposit banks, which, however, will not be refused.

In case of deposits, made in the deposit banks, a duplicate receipt should be taken, stating by whom the payment is made, and for what object. The particular patent should be referred to, to enable the applicant to recover back the twenty dollars in case of withdrawal of the petition.

On recovering back Money paid for Patents not taken out.

When a patentee relinquishes or abandons the application for a patent, he must petition the commissioner of patents, stating the abandonment or withdrawal of his petition, in which case twenty dollars will be repaid.

In case of withdrawing petition, the model deposited is by law retained.

Further remedy in Equity for Patentees.

In case of interfering applications with other pending applications or unexpired patents or caveats, a hearing is had before the commissioner of patents prior to the appeal to a board of arbitrators. In other cases the decision of the commissioner on the novelty and utility of the invention is made without a hearing, and from which an appeal may be taken to a court of arbitrators.

When the decision of the board of arbitrators shall be unsatisfactory to a party interested, a bill of equity can be filed in the United States courts, whose decision will be imperative.

On filing the Specification and Drawings as a Caveat.

"Whenever the applicant shall request it, the patent shall take date from the time of filing the specification and drawings, not however exceeding six months prior to the actual issuing of the patent; and, on like request, and the payment of the duty herein required, by any applicant, his specification and drawing shall be filed in the secret archives of the office until he shall furnish the model, and the patent be issued, not exceeding the term of one year, the applicant being entitled to notice of interfering applications."

A full description of the invention is required to enable the commissioner of patents to judge of interferences.

All applications will be examined, and patents issued, in the order of time in which the proper documents are completed.

Exhibitions of Model and Manufactures.

Unpatented models, specimens of compositions, and of fabrics, and other manufactures or works of art, will be received and arranged in the national repository of

the patent office as soon as the new building is finished.

Personal attendance of the applicant at the patent office, to obtain a patent, is unnecessary. The business can be done by correspondence (free of postage) or by power of attorney.

Oaths.

Any magistrate authorised to administer oaths is qualified to certify under this act.

Form of Petition.

To the Commissioner of Patents:

The petition of Sebastian Cabot, of Cabotsville, in the county of Hampden, and State of Massachusetts,

Respectfully represents:

That your petitioner has invented a new [and improved mode of preventing steam boilers from bursting,] which he verily believes has not been known or used prior to the invention thereof by your petitioner. He therefore prays that letters patent of the United States may be granted to him therefor, vesting in him and his legal representatives the exclusive right to the same, upon the terms and conditions expressed in the act of Congress in that case made and provided; he having paid thirty dollars into the treasury, and complied with the other provisions of the said act.

SEBASTIAN CABOT.

Form of Specification.

To all whom it may concern:

Be it known, that I, Sebastian Cabot, of Cabotsville, in the county of Hampden, and state of Massachusetts, have invented a new and improved mode of preventing steam boilers from bursting, and I do hereby declare that the following is a full and exact description:

The nature of my invention consists in providing the upper part of a steam boiler with an aperture, in addition to the safety valve, to be closed up with a plug or disk of alloy, which will fuse at any given degree of heat, to be governed by the proportions forming the alloy, and permit the steam to escape, should the safety valve fail to perform its functions.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation: I construct my steam boiler in any of the

known forms, and apply thereto gauge cocks, a safety valve, and the other appendages of such boilers; but in order to obviate the danger arising from the adhesion of the safety valve, and from other causes, I make a second opening in the top of the boiler, similar to that made for the safety valve, and in this opening I insert a plug or disk of fusible alloy, securing it in its place by a metal ring and screws, or otherwise. This fusible metal I, in general, compose of a mixture of lead, tin, and bismuth, in such proportions as will insure its melting at a given temperature, which must be that to which it is intended to limit the steam, and will, of course, vary with the pressure the boiler is intended to sustain. I surround the opening containing the fusible alloy, by a tube intended to conduct off any steam which may be discharged therefrom. When the temperature of the steam in such a boiler rises to its assigned limit, the fusible alloy will melt, and allow the steam to escape freely, thereby securing it from all danger of explosion.

What I claim as my invention, and desire to secure by letters patent, is the application to the steam boilers, of a fusible alloy which will melt at a given temperature, and allow the steam to escape, as herein described; using for that purpose any metallic compound which will produce the intended effect.

Witnesses: SEBASTIAN CABOT.

JOHN DOE.

RICHARD ROE.

If the thing desired to be patented be an original machine, the title, in that part of the petition and specification between brackets, should be altered thus: [have invented a new and useful machine, &c.] and if an improvement only, thus: [have invented a new and useful improvement on a, or on the, machine, &c.]

Form of Oath.

County of Hampden, State of Massachusetts, ss.

On this day of 183 , before the subscriber, a justice of the peace in and for the said county, personally appeared the within named Sebastian Cabot, and made solemn oath (or affirmation) that he verily believes himself to be the original and first inventor of the mode herein described, of

preventing steam boilers from bursting, and that he does not know or believe that the same was ever before known or used; and that he is a citizen of the United States:

Signed, A. B., Justice of the Peace.

If the following questions can be answered affirmatively before transmitting the papers, few applications will be returned for correction of omissions:

1. Is the fee transmitted?
2. Is the petition signed, and directed to the commissioner of patents?
3. Is the specification signed, and witnessed by two witnesses?
4. Are the drawings signed, and witnessed by two witnesses?
5. Do the drawings contain references? and if the specification refers to them, are duplicates sent?
6. Has the inventor made oath to his being a citizen, and that his invention is new, &c.
7. Does the specification contain a specific claim?
8. If an alien and resident, is this affirmed or sworn to?
9. Has the model been sent, and how?
10. Is the name of the inventor durably affixed to the same?
11. In case of reissue, is the old patent surrendered?
12. Has the oath of invention been renewed, before applying for a board of arbitrators?
13. Have the fees under \$5 been remitted in coin?

All communications should be addressed to the commissioner of patents.

HENRY L. ELLSWORTH,
Commissioner of Patents.

From the Repertory of Patent Inventions
NEW MODE OF HEATING BOOKBINDES' LETTERING-TOOLS.

Sir,—It is a well known fact, that heat diffuses itself through metallic bodies with great rapidity; and this is exemplified when we plunge a piece of brass into melted lead, the former metal almost instantly attaining a degree of temperature equal to that of the latter.

This circumstance has induced me to conclude, that bookbinders' tools might be

heated much more speedily, and with better effect, by dipping them into fused lead, or printers' type metal, or an alloy of lead and tin, than by exposing them, in the usual way, to a coke or charcoal fire. Sand floating on the surface of the fluid metal would, in a great degree, prevent the escape of its fume, and also retard its combination with the oxygen of the atmosphere.

An experienced bookbinder, to whom I stated my views, expressed his belief, that the adoption of the plan would be found very advantageous in finishing-shops, where gilding forms so important a part of the business.

I remain, Sir,

Yours respectfully,

Derby.

T. COGGAN.

It is not long since we introduced to our readers "Flint Soap." We now give specifications for a Soap from "*mica, steatite, or porcelain clay.*" No end to wonders in this world. By the way, would not the soap be apt to dull razors, and render it worthless as a shaving soap?

From the Repertory of Inventions.

SPECIFICATION OF THE PATENT GRANTED TO JOHN HEWITT, FOR A COMBINATION OF CERTAIN MATERIALS OR MATTERS, WHICH BEING COMBINED OR MIXED TOGETHER WILL FORM A VALUABLE SUBSTANCE OR COMPOUND, AND MAY BE USED WITH OR AS A SUBSTITUTE FOR SOAP.

My invention consists in combining the well known substances called mica, steatite, porcelain earth or clay, and gard or guard with soap, in the proportions herein particularly defined.

Having thus stated generally the object of my invention, I will proceed to describe the manner of performing the same; I take from one-eighth to three-fourths by weight of mica, steatite, of porcelain clay, or of gard, ground or reduced to a fine powder, or I take from one-eighth to three-fourths of these substances combined, and mix or incorporate such one-eighth to three-fourths with seven-eighths to one-fourth by weight of the ordinary soap of commerce, known by the names of mottled and yellow soap, but I prefer, and usually employ, one-half of the earthy substances and one-half of

soap, which, when combined in any of these proportions, will form a compound to be applied to the ordinary purposes of soap.

When it is desired to make a finer quality of soap intended for the purposes of the toilet, I take from one-eighth to one-half by weight of mica, steatite, or porcelain earth or clay, and mix or incorporate the same with seven-eighths to one-half of the soap of commerce called curd soap, and thus produce a valuable compound, which may be perfumed as is usual in fancy soaps.

Having thus given the definite proportions which constitute my invention, I will now point out the manner pursued by me in mixing or compounding the aforesaid substances with soap. Having determined on the proportion of mica, steatite, porcelain clay or earth, or of gard, which, as aforesaid, must be within the proportions of one-eighth to three-fourths by weight of the mass intended to be produced, and this is to be the case whether these substances are combined or used separately, for it is essential that these substances should not exceed or be below the proportions by weight here given, these being essential to the best effect being obtained. The soap, whether yellow, mottled or curd, is sliced into small pieces, and mixed with the substance or substances above mentioned, and the whole mixture or compound being placed in a suitable vessel is to be melted, (sufficient water being added to facilitate the operation,) and the compound, when well stirred and sufficiently blended, is to be allowed to cool in the ordinary manner of making soap, and cut into bars, it will then be ready for sale. Or it will be evident that in place of taking the soap of commerce, the compound may be produced by adding the substances in the proportions aforesaid to the melted materials of soap previous to allowing them to cool, which would be the most advisable course for a soap maker. It will be, perhaps, desirable here to observe, that the substances hereinbefore mentioned are found plentifully in Cornwall, and that the substance named gard or guard, is that part of the sediment which first precipitates itself in washing or cleansing porcelain earth or clay for the use of the China manufacture.

Having now described the nature of my invention, and the manner of carrying the same into effect, I would observe that I am aware that the various clays and earthy substances have been before used for cleansing both separately, and in some instances combined with soap, I do not therefore claim the mixing of the aforesaid substances generally with soap, or of the applica-

tion of them to the purposes of scouring or cleansing other than in the proportions before mentioned. I do therefore hereby declare that I confine my claim of invention to the mixing or compounding of mica, steatite, porcelain clay or earth, and gaud, within the proportions of from one-eighth to three-fourths by weight of the bulk of the compound to be produced with the ordinary soap of commerce, as above described, and thus producing a valuable compound, applicable to the various purposes of soap.—In witness whereof, &c.

Enrolled October 18, 1834.

SPECIFICATION OF THE PATENT GRANTED TO JAMES LEMAN, FOR THE MAKING, COMPOUNDING, IMPROVING, OR ALTERING OF SOAP. SEALED JUNE 4, 1835.

The oxymuriatic gas or chlorine is sold in commerce combined with soda, with potash, and with lime, under the denominations of the chlorate or oxymuriate of soda, the chlorate or oxymuriate of potash, and the chlorate or oxymuriate of lime; the first two in a state of solution, and the last in an earthy state. Chlorine combined with these three alkaline substances has been employed in washing and bleaching but where combined with soap, as described below, advantages and considerable economy are effected in both these operations, and that combination I claim as my invention.

The following are my processes or combinations:

First. To make chlorated soap in employing the chlorate or oxymuriate of soda.—1st. Take equal quantities by measure of a solution of chlorate of soda of a specific gravity of 1089, and of oil, and mix them perfectly together.—2nd. Heat the mixture over a very gentle fire to assist its combination.—3rd. Add to the mixture, ley of caustic soda, and continue the operation in the same manner as done by soap-makers, employing successively the ley of various degrees until the saponification is complete.

If, instead of oil, it is wished to employ fat or other saponifiable substance, it will be necessary to melt it previously over the fire, and then the mixture with the solution of chlorate of soda, and proceed in the same manner as is above directed for oil.

Second. Chlorated soap by the chlorate of potash. The process for the manufac-

ture of this soap is the same as the preceding: mix equal parts by measure, of a solution of chlorate of potash of a specific gravity of 1089, and oil or fat, or a mixture of both. Heat the mixture gently, and add the quantity of ley of caustic of potash or of caustic soda necessary to render the soap perfect. In other respects proceed in the same manner as the common manufacturers do.

Third. Chlorated soap by the chlorate of lime.—To make this soap.—1st. Mix thoroughly one part by weight of chlorate of lime with three parts of water, let the insoluble part subside and draw off the clear solution, which is commonly of a specific gravity of about 1072. Make a mixture of this solution with an equal quantity of oil or fat, or of a mixture of both, and stir up this mixture at intervals during three days, so that the combination of the chlorate of lime with the oil or fat may be complete.—3rd. Add ley of caustic soda at different degrees of strength as is done by manufacturers to make common soap.

Nota.—If fat or grease is employed it will be necessary to mix it with the chlorated solution in a heated state. In other respects the process is the same as before described.

The chlorated solution may be employed weaker, that is to say, if a specific gravity of 1033 or more. After having made the mixture with the oil, it will be necessary to stir it well and let it settle for twenty-four hours, draw off the water, then repeat this operation until the oil is saturated with chlorine to the degree desired. As to the quantity of water retained by the mixture it will be separated from it during the process of saponification, and will remain mixed with the water of the ley employed.

These kinds of soaps may be made by mixing the ingredients cold, and letting them remain for at least twenty-four hours, stirring them often. The ley must be employed at 1360, in the proportion of one-third of the quantity of oil used. Apply a gentle heat (a water or steam bath is preferable on account of the color,) until the saponification is complete.

If common soap is melted in a solution of chlorate of soda upon a moderate fire, this soap will become chlorated but it never will be so well combined as that of which the manufacture is above described.

A solution of chlorate of lime may also be added to the common soap dissolved by this means a chlorated soap will be obtained.

If it is wished not to employ the chlorate of soda or potash or of lime for the manufacture of soap, they may be replaced by water saturated with chlorine; or it is still better to saturate the oil or grease by means of a current of chlorine applied directly to it without the intervention of any alkali.

I claim also to form a chlorated soap through the medium of a combination of chlorine with all other alkaline substances. In witness whereof, &c.

Enrolled December 4, 1835.

METEOROLOGICAL RECORD

For the month of February, 1836, kept at Avoylle Ferry, Red River, La., (Lat. 31° 10' N. Long. 91° 59' w.) by P. G. Voorhies.

FEBRUARY.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	REMARKS.
1	32	48	36	calm	clear	heavy white frost
2	30	52	51	..	..	..
3	36	60	59	..	..	..
4	34	49	46	..	..	..
5	40	64	61	..	cloudy	..
6	41	61	42	..	..	..
7	41	68	61	..	..	..
8	33	61	60	..	..	..
9	47	62	60	..	..	rain in the morning and all day
10	56	70	65	..	..	rain and heavy thunder—storm all day and night
11	53	70	62	SE	..	Red river rising
12	65	60	58	S	..	rain all day and all night
13	64	62	52	N	..	rain in the morning and clear at noon, Red River on a stand
14	40	63	46	calm	clear	..
15	42	68	65	..	..	Red River falling
16	39	64	56	..	..	..
17	57	74	68	..	cloudy	light showers all night
18	59	69	59	..	clear	..
19	50	71	68	..	..	..
20	53	74	67	..	..	cloudy in the evening
21	56	68	64	..	..	..
22	60	68	61	S	cloudy	rain all day, clear at night
23	57	69	59	calm	clear	..
24	57	72	66	..	..	..
25	56	51	50	SE	..	cloudy evening, rain at night
26	50	48	50	NW	cloudy	..
27	36	50	51	NE	..	drizzling rain all day and all night
28	40	48	45	..	clear	..
29	55	69	71	calm	cloudy	drizzling rain in the evening

Red River fell this month 4 feet 5 inches—below high water mark 9 feet 3 inches.

METEOROLOGICAL RECORD

For the month of March, 1836, kept at Avoylle Ferry, Red River, La., (Lat. 31° 10' N., Long. 91° 59' w.) by P. G. Voorhies.

MARCH.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	REMARKS.
1	56	50	43	SE	cloudy	high wind from the north at night
2	32	54	43	calm	clear	heavy white frost
3	32	59	53	..	..	..
4	34	61	50	S	..	..
5	43	67	56	calm	..	cloudy at noon
6	59	69	68	S	cloudy	high wind from south-east all night and heavy rain
7	57	62	47	N	..	rain all day
8	41	61	52	calm	clear	Red River rising
9	46	62	47	S	cloudy	heavy thunder and rain at noon and all night
10	33	49	47	W	clear	heavy white frost—high wind all day
11	33	64	75	calm	clear	heavy white frost
12	43	69	64	SE	..	high wind from the north-west in the afternoon
13	59	71	68	SW	cloudy	high wind all day
14	61	72	65	S	clear	..
15	66	78	75	SE	..	..
16	67	80	73	S	..	very high
17	69	79	72	..	cloudy	rain and heavy thunder at noon
18	58	68	62	calm	..	rain all night, Red river on a stand
19	60	64	52	..	..	drizzling rain all day and all night
20	46	47	46	..	..	..
21	48	52	47	..	clear	..
22	41	50	45	..	..	..
23	34	48	45	SE	..	..
24	44	56	48	..	..	..
25	48	58	46	calm	..	..
26	45	61	57	..	..	..
27	43	60	58	..	..	..
28	48	71	68	..	..	..
29	65	63	70	..	cloudy	drizzling rain all day
30	64	74	76	..	..	..
31	64	70	66	..	..	rain at noon

Red River rose this month 1 foot 6 inches—below high water mark 7 foot 9 inches.

ANOTHER NEW STEAMBOAT.

The "RHODE ISLAND" has been placed on the line between Providence and this city. We received an invitation to her first trip, but were prevented by business from going—much against our will, as from the character of the other boats of the line, we had formed high expectations of her performance.

We have since understood that she gives universal satisfaction. We rejoice at every new facility given to the travelling community, and at none more than the starting of a new steamboat—one of the noblest triumphs of art.

We wish success to the Rhode Island, and every other vessel of the line.

[Railroad Journal.]